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BRIEFLY TOLD.

DEATHS OF TWO FAMOUS ENGLISH GAS ENGINEERS.—The English gas fraternity may be sure that their American confreres share with them their great sorrow over the deaths of two men who by their accomplished works have made their names as household words where men who have knowledge of the gas industry abide. The first to pass beyond was Mr. William Thomas Sugg, whose death occurred at his residence, "Morningside," Clapham Park, London, the morning of Thursday, February 28th. He had been not quite himself for perhaps a year, but he had remained active in his profession until the 19th ult., the last time he visited his offices in Regency street, Westminister. The *Journal of Gas Lighting* for the 5th inst. contains a lengthy article respecting his notable career, in the course of which it is said that "Mr. Sugg was born in Westminister—a fact to which he always referred with gratification; and his close connection with the ancient city was unbroken, for at the time of his death he was a Churchwarden of St. John's. His father established in 1838 a gas meter and fittings business in Marsham street, and under him, as an apprentice, and in the works of the South Metropolitan Gas Company, under the late Mr. Thomas Livesey, he acquired a knowledge of the manufacture of gas and the construction of the appliances used in its distribution. In 1858, he joined his father, and on the death of the latter in 1862 acquired the business. He had previously turned his attention to the improvement of gas burners; and had made the first argand steatite-top burner, which was tested by the late Mr. Henry Banister, of the Gas Light and Coke Company, against his own iron top burner, and found to be better. He also made in 1858 the first burner which might be considered as the standard burner used for the testing of gas in England; and he designed, in 1862, in conjunction with Dr. Letheby, an improved form of this burner, which came to be known as the Sugg-Letheby standard burner for 14-candle gas. Mr. Sugg commenced the manufacture of steatite, flat-flame and argand governor burners; and on September 5, 1866, he took out what appears to have been his first patent for an 'apparatus for regulating the supply of gas.' In 1868, another patent was obtained for a similar purpose; and in the following year, one for 'improvements in gas burners.' His attention was not, however, confined to burners. From the time he joined the business he had been occupied in designing, manufacturing and putting into operation all the most perfect apparatus used for testing the illuminating power and purity of gas. The passing of the Metropolis Gas Act in 1860 gave him excellent scope for the exercise of his skill in this direction." Mr. Sugg was in his 75th year. The funeral services were held in the Church of the Ascension, Balham Hall, the afternoon of Tuesday, the 5th inst., and prominent in the great throng that participated in the honors that were paid to the dead was Sir George Livesey, his associate and friend for quite a half century.

The other world renowned gas man to join the vast majority was Mr. William Young, of Harehope, whose summons came the afternoon of the 1st inst., at his home in Priorsford, Peebles, Scotland. Mr. Young was born at Selkirk, Scotland, in August, 1841, and the history of his life, as told in the *Journal of Gas Lighting* (also for the 5th inst.), would, as our contemporary remarks, "fill a volume, and that his change from the management of a gas works" (that of Lasswade, Scot-

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land, and in his 22d year) "to the field of the oil industry was brought about in a manner so natural that a narrative of it reads like a tale from a story book." The interesting record of him printed in the authority named, in the introduction thereto remarks: "The death of Mr. Young * * * removes from the activities of this world one who had no peer in the particular branches of science in which he interested himself. His whole lifework was in connection with the gas industry and with the oil industry of Scotland; and while the former benefited greatly by his researches, the latter owed to him its position as a commercially profitable enterprise. It was he who took it from a languishing cradle and placed it upon its feet fully equipped, and who, for more than 40 years, was its mainstay. While these industries absorbed his business attention, there was not a connection he had to whom he did not endeavor to introduce some improvements, and few which he did not leave better than he found them. His studies and his achievements—to speak of struggles would be a misnomer—for though he was born poor, his first effort brought him a competency—would fill a volume." The funeral of Mr. Young was from his late residence, the afternoon of the 5th inst., the services being conducted by his friend of years counting to exceed the average life of man, the Reverend James Dewar. In attendance were those of high rank and low, and the simple though uplifting services for the Baptist dead were as touching as any that were penned by that master of such tributes, the composer of the "Bonnie Brier Bush."

MR. MOSES TO PUT GAS INTO THE JAMESTOWN EXPOSITION.—Mr. W. E. Cottrell, Governor of Works, Jamestown (Va.) Exposition, has retained Mr. Frank D. Moses to arrange for the gas supply of the grounds and buildings during the continuance of the Jamestown display, which promises to be far more important and attractive than the best hopes of its promoters looked for. Brisk and capable as he undoubtedly is, Mr. Moses will have all he can do to get the gas supply on in time, for the opening day of the Exposition is set for April 26th. The short space of time at the disposal of Mr. Moses (the work is of considerable magnitude, in that the service requires the piping of gas from Richmond, perhaps 8 miles away) is altogether attributable to the Governors of the Exposition, who at the outset of the planning considered that gas was not a necessity respecting the scope of the display.

MR. I. C. BAXTER RETIRES FROM ACTIVE BUSINESS.—Mr. Isaac C. Baxter, more's the pity, has decided to retire from active business and indulge in a good, long rest somewhere on the Pacific Slope. The first positive sign that this is certain is found in his resignation as President of the James Gardner, Jr., Company, of Pittsburgh, Pa, but that is not to be understood as meaning that that Company will cease or even curtail its operations. His associate and partner, Mr. Peter Young, will take care of that. It is true, Mr. Baxter (we are hard put in refraining from calling him "Uncle Ike."), has fairly earned a respite from active business life, and he takes with him the respect and affection of the many, many scores with whom he has been associated in the closest way for years-upon-years. That we all wish him good luck *a tout outrance.*

A BELATED MENTION OF A GOOD TIME.—A much belated mention this is of the holding of the second annual banquet of the clerical force of the Brooklyn Union Gas Company, which was happily held last month in the handsome dining rooms of the Kings County Democratic Club, Schemerhorn street, Brooklyn, N. Y. The occasion was a very enjoyable one, and the banquet was preceded by an excellent vaudeville entertainment. The guests numbered 250, the especially honored ones being: J. H Jourdan, Chief Engineer, West. Div.; A. F. Staniford, Asst. Treas.; F. B. Jourdan, Asst. Secy.; and J. H. Benedict, Cashier. The toastmaster was Mr. W. S. Hicks, and he certainly used the tuning fork like a master of the baton, in that with it he extracted from the guests many "harmonious sounds."

CURRENT COMMENT.—

"L. V. W.," writing from Chattanooga, Tenn., under date of the 18th inst., incloses the following: "The Chattanooga Gas Company's employees are rapidly developing a social organization that is pleasing and satisfactory to the Club members and to the officials of the Company. At the regular meeting of the organization, which is called the Commercial Council, held the evening of the 14th inst., business having been concluded, President Roddy declared the social session was in order, and this meant an excellent buffet luncheon, which was prepared on the spot, the numerous appliances of the Company coming into play. An orchestra, composed of members of the Council and consisting of a pianoforte, two violins, a clarionet, cornet and trombone, rendered a number of elegant selections. Mr. Samuels entertained with a cornet solo and Mr. Isaacs with a vocal solo. Short talks were made by Mr. Lowe, Superintendent of the Company; Mr. Harbor, Chief of the Accounting Department; Mr. Hunting, Commercial Supervisor, and Mr. Schall, a representative of the Detroit Stove Works."

[OFFICIAL REPORT, AS FURNISHED BY THE SECRETARY.—CONTINUED FROM PAGE 446.]

THIRTY-SEVENTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB 20 AND 21, 1907.

FIRST DAY, MORNING SESSION.

Discussing the Paper by Dr. A. C. Humphreys.[1]

The President—Gentlemen, you have all heard the very able, full and illuminating speech of Dr. Humphreys. He is too good a gas man to have his orthodoxy questioned. What he stated was his convictions, and I don't know any member of the Association more entitled to his convictions and to have those convictions respected than Dr. Humphreys. As an expert he is qualified to speak. A great many things that he has touched on need to be discussed. You want to discuss them. A great many questions you want asked. That is why the paper is read. That is why we are here. There are two or three recommendations—they are not recommendations, but we will take them as such—namely, that I later appoint a committee in connection with the depreciation clause and also one to meet a committee of the American Gas Institute. Gentlemen, the paper is before you. We would like to hear from Mr. Lamson, of Worcester.

Mr. Lamson—Mr. President, I think this matter is too serious for immediate discussion. This very thorough and embracing paper is on a subject on which many of us have very strong opinions. I should not care, without more study of the paper, to make any discussion.

The President—I am certainly of the same opinion as Mr. Lamson. It is a very large question, and it has been handled in a masterly fashion. Possibly there are some questions that you would like to ask Dr. Humphreys. Mr. Prichard, we should like to hear what your impressions of the paper have been.

Mr. Prichard—Mr. President, I feel as Mr. Lamson does about the matter, that this is a broad and vital question. It is a question that we of Massachusetts particularly have to face pretty soon; in fact we are facing it now. Our capital stock, as returned to the Commissioners and published by them, if considered as representing the amount of money invested in our business, is very misleading in many cases. For instance, in quite a few cases stock of a par value of $100 has been issued at $150 or even $200. It appears in our list of liabilities, of course, on the $100 basis. The average consumer wonders perhaps why he should be paying say 10 per cent. on the capital stock, not knowing, and possibly not caring, that they are paying perhaps only 5 per cent. on the money actually paid in. All they see is that they are paying 10 per cent. on the capital stock and naturally think this is too much if money is getting only about 6 per cent. Again, the prudence and thrift of many of the old New Englanders led them to deprive themselves of the dividends they should properly have had, and they in many cases for many years devoted a very considerable portion of their earnings towards building up the plants. In other words they re-invested. Instead of calling for fresh money, which meant the issuing of new stock, they simply took the money they had earned and re-invested it in the plant. Is it not fair, now that gas by the efforts of the companies has been reduced to a low selling price, that this money which they deprived themselves of years ago should not bring them some return? I believe if the average consumer knew there was invested in many gas plants a large amount of money not represented by capital and a large amount of money which represented only the issue of a portion of its value in capital stock, they would be perfectly willing that the gas companies should pay a dividend based on the money that they have invested in their business. I made a statement last night somewhat carelessly, but I think it worthy of farther thought, that gas companies are one of the poorest paying investments. This may strike you at first as a little off, but if you will compute the returns to the investors, based on the amount of money actually invested in the business, I think you will be somewhat surprised to see how low a rate they are receiving. Just how this matter can be straightened out I do not know, but it is a thing that should be righted because it is positively wrong. In the case of the Boston Companies, it was done by act of Legislature and possibly that may be the proper remedy. I am very glad this matter came up and only wish we could have had the paper a few days in advance, that we might have discussed the points brought up a little better.

Mr. Nettleton—Mr. President, like the others I dislike very much to

1. For the text of the paper, see JOURNAL, ante, pp. 396, 444.

discuss so important a question off hand, and yet Dr. Humphreys has put so much time and thought into the preparation of this paper that I feel it is a duty that I owe him as one of the members to contribute something to the discussion. This paper is really fairly illustrative of what Dr. Humphreys has been doing for the various Gas Associations for 30 years or more. In spite of being very actively employed, and perhaps now more actively than ever, he has found time to write such a splendid paper as this, and I think we are all under very great obligations to him. There are a great many statements in this paper that I think will be of service to the gas people of Connecticut in the trouble they are now having. It may not be known to you, but we have the 80-cent bill, practically a copy of the New York bill, introduced in our Legislature, and I believe this paper will help defeat it. We hope it will not pass. In this whole question of the issue of capital stock and the dividend rate on same it seems to me we have got to take the happy medium. Times have changed since I started in the business in 1870. Formerly 10 or 12 per cent. was not an unreasonable rate of interest. Until very recently I think a corresponding rate would be 5 and 6 per cent., and the public have got to a point where they will not be willing that a large dividend should be continued indefinitely on gas stock or generally on stock of public utilities. It has seemed to me for some time that the position of the companies in Massachusetts was not being improved by the action of the Commission in insisting that, large premiums, frequently 100 per cent., should be paid in on new issue of stock. That puts the State practically back of the company in allowing them to pay 10 or 12 per cent. dividends; and how long will the public stand it? I cannot believe that they will stand it indefinitely. The only thing they will know, as Mr. Prichard has stated, will be the fact that this public service corporation, dealing with that which is a necessity, or is rapidly becoming so to almost everyone, is paying a big dividend. I wish that it might be otherwise. Personally, as I said before, I do want to thank the Doctor for this paper. To me it is a remarkable paper on the subject, and I am sure it will be of service to us for years and years to come.

Mr. Gardiner—Mr. President, in connection with what Mr. Nettleton just said I would like to say that the public is directly interested in having these public utility companies get their investment money as cheaply as possible. In the case of the London Gas Light and Coke Company this feature was gone over very carefully when the rate of dividend was changed and the capital extended by act of Parliament, so that it might be financed more cheaply. I think the attitude that these people took is perhaps not exactly in accord with Mr. Nettleton's suggestion. Another point along the same lines. In the case of the City of Columbus *vs.* The Columbus Railway and Light Company the Master's opinion stated specifically that an inalienable part of the value of a property was the managerial ability and experience—I might call it goodwill—without which the property would be practically worthless, and that goodwill, if I may use the term loosely, was a legitimate part of value, which should be allowed to be capitalized and which should be allowed to pay earnings. It seems to me that that opinion is in extension of the tangible value theory. I have been immensely interested in Dr. Humphreys' paper. Certainly it is a most illuminating paper, and a most opportune one. There is at present a movement for the appointment of a Commission in 6 other States this year. There is a very strong movement to facilitate the municipalization of properties. I should say, guessing at it, that probably 20 States have had bills introduced in the Senate and House, making it easier for towns to issue bonds and acquire municipal properties. So that with this situation, Dr. Humphreys' paper, it seems to me, will do much good.

The President—This is a good paper for those who do not have to get in and clean out a hydraulic main to discuss. I think we ought not to let any treasury man go free. We have Mr. Fowler with us. We should like to hear from him.

Mr. Fowler—Mr. President, if I understand it, one clause in Dr. Humphreys' paper is a plea for capitalization in excess of the value of the active assets, and the reason for that plea is that the undertaking can thus be more readily and economically financed. Most of us are Massachusetts men, and are accustomed to live under the laws of the State of Massachusetts. People who don't like our laws, even Massachusetts men, may go outside of this State and form companies in the way indicated by the paper, but in Massachusetts we are obliged to put in the money or the goods worth the capital stock of the company; that is, nothing above the assets. It seems to me that that is, so far as the public service corporations are concerned, the only way to do the business properly, for if the stock is watered the public feels that there is too much temptation on the managers of the companies to pay dividends on that watered stock. If it is watered by one-half, a 5 per cent. dividend would be the equivalent of a 10 per cent. dividend without water, and on new corporations a 10 per cent. dividend is very large for a public service corporation.

The President—Mr. Barnes, we would like to hear from you.

Mr. Barnes—Mr. President, I did not get in until the paper was nearly finished, so I am not familiar with it.

The President—You don't know what you have missed, sir. Is there any other gentleman who would like to say anything on the paper read, or is there any question that anyone would like to ask?

Col. Richardson—I would like to ask the Doctor what per cent. of depreciation was considered proper, or was agreed upon, by the committee in the report, that item being omitted for the reasons given by the Doctor?

The President—I think the Doctor is making a minute of quite a number of those questions that you propounded, and possibly wants to answer them all at once. Is that it, Doctor?

Dr. A. C. Humphreys—Yes.

The President—Mr. Ramsdell, we shall be very glad to hear from you.

Mr. Ramsdell—Mr. President, I do not know that I want to discuss the paper at all, but I would like to say I think this paper is exceedingly opportune and one of the most valuable ever presented to any of our Gas Associations. As you are probably aware, I have been the Secretary of the American Gas Light Association for the past two years, and owing to the fact that the property of the Association has not yet been turned over I still have possession of its property. I have been very much surprised at the continual demand for the "Uniform System of Accounts," which was the report of the Committee appointed by the American Gas Light Association, of which Dr. Humphreys is the Chairman, and which was published by that Association. There is a continual demand for those uniform accounts, and the demand comes from all kinds of sources. It does not come from gas companies more than from outsiders, and I am unable to tell what relation they bear to gas interests. Undoubtedly they are either accountants or legal gentlemen, or something of that kind. But we have these calls for that system of accounts all the time, showing conclusively there is quite a demand for a uniform system of gas accounting. I don't think there is any question whatever about that. In regard to the feature of depreciation, this seems to have been something that has been universally avoided by the gas industry. A few years ago I was asked to prepare a paper on the subject of depreciation by The Society of Gas Lighting, and to my very great surprise I could not find any data of value on the subject of depreciation since the article prepared by Dr. Schiller some 12 or 15 years previously. That was practically the only article that I had access to or could find on the subject, and that article I had to have translated before I could read it. It is one of the most vital questions of the day in regard to the gas business, and yet it is one that has apparently been avoided very largely. So little information is obtainable and because there seems to be such a wide diversity of opinion on the subject, it is a difficult problem; there is no question about that. When I prepared my paper I expected it would be thoroughly discussed and probably torn all to pieces, and I was hoping that it would be. I only wanted the paper to produce enough discussion to establish something that would fit the requirements of the case. Unfortunately, when the paper was presented—I don't remember just the reason now, but there was some reason why no discussion was held at that meeting—the subject was postponed until the following meeting. In that way it never was properly discussed. It had been published, but unfortunately there never was any discussion worthy of the name on it. It is a subject that I think ought to be taken up by the Gas Associations and thoroughly threshed out. I have been very much interested in this paper, and I personally feel under great obligations to the Doctor for it.

Col. Richardson—Mr. President, it is a fact, I think everyone will agree, that if we had no other paper than this the meeting would be a success. It is a fact, also, I think, that the New England Association meetings are always of value; but time is of importance now, and whereas the discussion could be continued with profit the rest of the day we have not much time. I wish to improve the opportunity and have the pleasure of moving a rising vote of thanks to Dr. Humphreys for this splendid effort, for his generous giving of time and coming here at no little personal inconvenience, but to our great improvement and betterment. Mr. President, I move a vote of thanks for this splendid paper.

The President—Before I put that motion, if the gentleman will allow me, possibly the Doctor might want to answer the questions. Or would you prefer to do that after dinner, Doctor?

Dr. A. C. Humphreys—It won't take me over 5 minutes to do it.

The President—Then suit your convenience.

Dr. A. C. Humphreys—I will answer now, and get through with it. There is very little to be said, gentlemen, in reply. I am very sorry Mr. Fowler left the room, but I have still got Mr. Nettleton before me. I am really obliged to both those gentlemen for bringing that point up, because I think it is one of the vital points of the paper. I am very glad to be able to say that I can improve what I have written there, make it correspond more to my exact meaning, by the introduction of a single word. I should not want to cut the paragraph out, unless it is the will of the Association. I am entirely willing to bow to their will. I think the very foundation of the whole matter is right in that paragraph. I would suggest that in the fourth line, after the word "active," we make it read, "value of active, tangible assets;" introduce the word "tangible." You will notice in my paper I made no reference to intangible assets, because I wanted to concentrate the attention of the New England men, the Massachusetts men especially, on the fact that the tangible assets, the monies actually, literally invested in the business, were not represented by the facts as presented in the reports, and that you were not even allowed to pay dividends on the active, *tangible* assets. I did not want to divert your minds by referring you to the intangible assets. But, of course, it stands that there is intangible value in every gas company, if it is any good, and the courts will support you in that from first to last, I believe. Mr. Gardiner has referred to that in connection with the Columbus case, and I believe that will stand, in principle at least. It stands to reason. Here is a plant which has just been erected. You have got the works built. It has not depreciated one particle. The mains are laid in the street, ready for business. Is that plant, and the business accompanying the plant, of as much value as 5 years later, when those mains are being actively employed to distribute gas and the works are being actually employed to make gas? It is ridiculous to think so. The Columbus man—Master I think he was—stated that goodwill was influenced by the managerial element included in it. One management will go there and make that goodwill worth a certain amount, while another management will go there and make it worth a great deal more, or perhaps less. There is a variable element in that goodwill—goodwill is an intangible thing. And there is also the question of franchise. Now, referring again further to that same point, money actually invested and employed in a business should be shown in the asset accounts and be represented by capital. Provision should be made for the issuing of capital in excess of the value of active, tangible assets, provided the rate of return is properly adjusted and controlled, and the undertaking could then be more readily and economically financed. Is it any more burden upon the public, as I have said in my paper, whether you have $1,000,000 of capital, upon which you demand 8 or 10 per cent., or whether you have $2,000,000, on which you pay 4 or 5 per cent.? The burden is the same. And isn't it true, as Mr. Gardiner has pointed out, that the public are much less apt to be restive under a larger capitalization which can be justified by a low rate of return? I am not speaking of water in the sense that some of these gentlemen are. I tried to show plainly in my paper that there is water and water. Are not the people much less apt to be restive under a low rate of return on a capitalization which includes not only all the active tangible assets, but a capital which also makes some allowance for the intangible values? And very often the intangible values are of more real value than the tangible, paradoxical as it may seem. I think that can be proved without the slightest doubt. I see that Mr. Nettleton does not agree with me, and I will take lunch with him. [Laughter.] I will express my sympathy to Mr. Nettleton in connection with the proposed 80-cent gas bill now up for action in Connecticut. I was interested to hear what Mr. Gardiner had to say about these other commissions. I did not know that they were getting so actively to work in that line, and perhaps my paper was even more opportune than I supposed. I was not aware that there were 30 States really definitely going to work on the "M. O." principle, but I think that they are a few days behind the fair. I think the "M. O." wave is on the decline. I don't know whether members here are aware that nearly 200 municipal plants in this country have been shut down, first and last. I wish that the Massachusetts men, especially men that are represented by friends Fowler and Nettleton—oh, Mr. Nettleton is not a Massachusetts man, New England man—would think again about that question of water. I quite agree with you in the virtuous attitude that you take, that you don't want to load the people up with capital, and therefore, I say you have got to discriminate between water and water, and I assert distinctly it is not water if we represent the full value of our business, and then demand a return upon that amount of capital. For instance, the great Bemis acknowledges that it is all right to take your business and capitalize it on a basis of a 5 per cent. return. He does not do that in every case, you remember, as I told you; he only does so where he is trying to get the gas company's pipes up to a high valuation for the sake of an assessment. Still, he does stand for it. Now, here in Massachusetts you are distinctly opposed to that line. You are not even showing actual money invested in the business. You are allowing the Commissioners to take your money right away from you, and what is going to happen to the stockholders that come after you? After you, the deluge. What right have they to say they are going to make any law that is going to be retroactive in its effect, and that because they say certain of this plant has been put up by profits unrighteously taken from the public they are not going to allow you to continue to pay on it? It is just as much the property of your stockholders as if you had paid that capital in as capital, that is, as if they had first received the full dividends and then had paid part back for additional capital. I can show you case after case, like Cleveland and Cincinnati, for instance, well known cases, where they were not built up by the monies taken from the people. Possibly they did pay big dividends at times, and possibly they charged pretty good prices; but those were the days when that was not a business which had made its way. It was still an uncertain business. Furthermore, the dividends that were paid were at low rates. Didn't the stockholders and officers have the right then to agree that a certain part of the legitimate earnings should be paid out as dividends and part be reinvested in plant necessary for extension of the business? I investigated one company with a view to purchasing it, that had been built up in that way. There the claim could have been made, and such men as Bemis and Marks would not have hesitated to make it, that they had no right to get a return on the value of that property as I appraised it. What were the facts? For years they paid no dividends, for years after they paid 4 per cent., for 2 or 3 years thereafter 5 per cent., and never paid above 7. When I appraised the value I brought in a valuation almost double what we had expected to pay for it, because it was finally handed over to me by both sides to appraise the value on a certain per cent. return, and my report was taken as a final estimate. To my surprise, and to the disgust of my clients, they had to pay about double what they expected to pay. Col. Richardson asked as to what per cent. was allowed by the committee in connection with our work on a uniform system of accounts. He asked me whether I would like to reply to that, and I said "yes," because I wanted to further explain. We did not decide on anything, that was the trouble. It was because we found such a difficulty in making any statement that would hot be open to criticism. We worked hard on this thing, gentlemen—you hardly can comprehend how much work we did put into it—and after we worked hour after hour, way into the night, this question would always come up, and we finally dismissed it in despair, as I say. Where we were at fault was not in the fact that we did not formulate a rule for general adoption, but that we did not make a distinct statement that depreciation should be systematically cared for. I don't believe any of us is competent (I certainly am not) to say what should be the proper per cent. for general adoption. What would be proper for one of you would not be proper for another, because you all see at once that companies vary in the way their works are built, the way they are managed, and the way their accounts are kept in regard to repairs. This very company to which I referred a minute ago kept its repair account in such a way that the plant had been built up out of that account. It is an open secret, as I presume Mr. Addicks will acknowledge—it has been put in the papers and all; in fact, I put it in my paper—that the rate we finally figured out as being about right for the Consolidated Gas Company, under its special conditions, in view of the way in which it kept its account, was 2½ per cent. on the property in addition to its repairs, but not in addition to its renewals. That included its current renewals as well as its accruing renewals (is not that plain?) differentiating between repairs and renewals. We made up a statement which showed, or I did—Mr. Addicks, for instance, figured his in a little different way and came out with practically the same result—that if you allow for repairs, let that go in direct as a cash payment to operating cost, including in repairs the ordinary everyday breakdowns, then in addition to that there will be the current renewals, like retorts, a broken pump that cannot be repaired or renewals of that character, and so you set aside an amount equal to 2½ per cent. a year on the whole of the depreciable property, that would in that case be enough to cover those current renewals, plus the deferred renewals, and plus, as I call it, the final renewals in other years, the accruing depreciation. As an example, you make the distinction between retorts which are renewed at short intervals, and the deferred renewal, or final renewal, of the bench or stack. This question of depreciation

a very big one, and I could talk on it much longer than you gentlemen would like to hear me. I have taken too much time already. I would say to those who are interested in it and want to study it from an Englishman's standpoint, and from the standpoint of an Englishman who practices as a consulting engineer and is evidently by his writings also an accountant, that I would recommend to you the work by Ewing Matheson on "The Depreciation of Factories." You can get it at Van Nostrand's or at Spon & Chamberlain's. Of course you have to bear in mind that the conditions here are very different from the conditions in England; but there is a great deal in that book that is very enlightening. I am very glad to hear from Mr. Ramsdell of the demand for the uniform system of accounts, and I tell you, gentlemen, that the protection we gas men of America must look to to-day is to have a statement of facts to which we can refer. Just think of what a benefit it would be if you could go before any court of inquiry, commission or committee and say, "There is the result of such and such work done by such and such Associations, that such and such men of character and ability have worked out, and that is really the honest effort of the gas men of America to put down what they believe to be true." It certainly would have tremendous weight. And I tell you it is the facts that are going to prevail in the long run. Truth will prevail, but the trouble is a lot of us get knocked out while the truth is catching up. [Applause.]

The President—Gentlemen, you have all heard the resolution offered by Col. Richardson.

Mr. Lamson—Mr. Chairman, I should like to second that motion and to say one word in regard to my declining to discuss the paper. It was simply because of the importance of the paper. There is so much to be said on the subject that I thought to undertake to discuss the paper without careful consideration would be unwise. This whole question of "returns made to gas commissions," and the use made of those returns, is a very vital subject in Massachusetts. We have a Commission in this State that has been in existence a great many years, and returns have been made to that Commission which the Companies have felt were, in a sense, confidential. In recent years these returns have become more and more enlarged, and they have been put to wrong uses, because of the Commission allowing free use of those returns by irresponsible men, who use them for strike attacks. New York has very recently established a Gas Commission. Before they had hardly taken their seats or became in any way familiar with the business, they started in, in a very strange manner, to attempt to investigate the New York companies, and their "strike experts" exhibited and used the returns of the Commission. Connecticut is talking of establishing a Commission. It would certainly be very desirable if these questions could be considered by all the companies and a uniform system of accounts agreed upon. This, however, should only be done after very careful and due consideration and some better understanding with the State governments as to the use to which these reports should be put. I hope the whole matter will be continued and that we shall take it up at some future time in a more extended manner. I second the motion to extend a vote of thanks to Mr. Humphreys, for I appreciate personally the paper very much and am very glad he has written it.

The President—Gentlemen, all in favor of the motion will rise. (Everyone rose.) Dr. Humphreys, it gives me great pleasure to present the members of the Association on their feet as one man, in token of their appreciation of as masterly an address as we have had for years. We hope that you will not suffer from the length of time we have kept you on your feet.

Dr. A. C. Humphreys—Much obliged, Gentlemen.

The President—The next order of business will be

ROLL CALL.

Honorary.

Sherman, F. C.

Active.

Addicks, W. R.	Coffin, J. A.	Hawken, T.
Africa, W. G.	Coggeshall, H. F.	Hintze, T. H.
Alden, G. A.	Cook, R. W.	Humphreys, C. J. R.
Allen, B. J.	Cooper, A. F.	Humphreys, J. J., Jr.
Anderson, W.	Corson, F. H.	Humphreys, A. C.
Barnum, D. D.	Crafts, H. C.	Jennings, F. W.
Bill, W. C.	Dolan, J. B.	Kelly, H. H.
Brown, J. S.	Eccles, A. D.	Lamson, C. D.
Burritt, D. F.	Fowler, S. J.	Lawson, W. H.
Butterworth, C. W.	Gifford, C. H.	Learned, W. A.
Cathels, E.	Gifford, N. W.	Learned, C. A.
Campbell, A. J.	Gould, V. K.	Leland, G. B.
Cheney, H. N.	Havener, F. N.	Leonard, C. F.
Macmun, G. F.	Nute, J. E.	Spaulding, C. S.
Manchester, G. L.	Prichard, C. F.	Spear, J. N.
Mansfield, G. W.	Prichard, C. R.	Stone, A. F.
McGregor, W.	Priest, G. H.	Thayer, W. F.
McKay, W. E.	Philbrick, J. E.	Todd, J. R.
McQueston, W. M.	Quinn, A. K.	Walker, W. L.
Morrison, H. K.	Richardson, F. S.	Waters, J. A.
Nettleton, C. H.	Sargent, F. H.	White, C. E.
Norton, H. A.	Sharp, R. P.	Wood, W. A.
Norton, W. F.	Snow, W. H.	Young, A. M.
Norton, P. T.		

Associate.

Barnes, A. M.	Davis, F. J.	Nichols, W. B.
Barnes, F. G. P.	Dunbar, A. S.	Osborne, R.
Blanchard, G. L.	Gardiner, W. H.	Rausehausen, L. A.
Burr, A. R.	Hall, A. S.	Scranton, G. H.
Caldwell, G. A.	Higgins, A. A.	Storer, E. I.
Coburn, C. M.	Hinman, C. W.	White, H E.
Cortis, D. T.	Holmes, R. E.	Wrightington, E. N.
Crowther, A. W.	Humphreys, F. W.	

A COMMUNICATION FROM THE SECRETARY.

The President—Gentlemen, if there is no objection we stand adjourned until 2:30. One moment; the Secretary has a communication to make.

The Secretary—The Secretary has always something to say. There is an invitation for the members of the Association to visit the large gas power plants of the Boston Elevated Railroad to-morrow afternoon, if any of the members wish to. If they do, some expression of that wish given at this time would enable the Secretary to make arrangements which can be announced later.

The President—Well, gentlemen, you have heard what the Secretary requests you to do. Govern yourselves accordingly, and let him know some time after dinner. Notify as many as you may meet on the outside of the room, who went out before the announcement was made by the Secretary, so that a goodly number can be secured. You want to get enough to charter a car?

The Secretary—We'll want to know whether the members want to go or not. If they want to go, they can; if they don't want to go, they need not.

Recess till 2:30 P.M.

FIRST DAY—AFTERNOON SESSION.

The Association reassembled at 3 P.M.

The President—The first business of the afternoon will be the paper by Mr. E. N. Wrightington, Secretary, Boston Consolidated Gas Company, on

SOME COMMERCIAL DEPARTMENTS IN THE WEST.

Having understood that the gas companies in the West had always been very active in the development of the business and in pushing sales of gas, I took occasion the first of the year to make a tour of some of the principal cites, with a view of ascertaining the methods used and the results attained. The trip was a rather hurried one, and I had only time for one day's observation in Detroit, one day in Chicago, three days in Denver, one in St. Louis, one in Cincinnati and one in Baltimore. The reception on the part of the management of these companies was extremely cordial, and I am indebted to them all for a great deal of valuable information.

Selling Appliances.—In almost every instance all appliances are sold by the gas companies themselves and in some cases a large profit over the actual cost of the appliances is secured. In the others the sale price just about equals the cost of the appliances and connecting. Where the connections are made, these are credited to the "New Business Department" expense. Fuel appliances are generally sold at a very large profit, usually 100 per cent., the statement being made that the purchasers who are accustomed to pay a high price for coal and oil appliances would not feel that they were getting good value unless they paid very nearly an equivalent amount for the gas appliance.

Stoves are sold from $18 to $23, connected, according to the conditions in each city. This price is for an 18-inch oven stove. There is no question but that they can get more for a stove in the West than in the East. The people spend their money more freely and everything is on a more liberal scale. The daily newspapers are sold for 5 cents a copy instead of 1 cent, or 2 cents, as in Boston. It is a noticeable fact, however, that they get the highest prices where they are most active in the sales' department. As showing how small a part the price plays in this work, I will cite an instance which occurred in one of the companies that I visited. A vote was taken among the commercial men,

as to whether a recent advance in the price of stoves of $3 had had any appreciable effect upon the sales of the past year. Twenty-five of the men thought the price had not affected the sales, and only 7 thought it had. After a careful consideration, I think it is fair to say that it would be difficult for us to get the same prices in the East as in the West, and particularly as applied to Boston, on account of the fact that at one time stoves were given away here. Generally speaking, the price of the article sold is not the important thing, but the energy and brains used to introduce it.

Representatives.—The number of representatives is considerably in excess, in almost every city, of what I think is the practice in the East. Some cities ran as high as 1 salesman for every 7,000 population. Almost all the companies have specialty men, such as fuel, power, new buildings, stove demonstrators, experts on piping, supervisors, etc. Of course, with this very large force they are able to search out every opportunity along their lines and follow up for business. It is possible with this equipment to make a call upon every family once in 60 days.

Reports and Office Records.—Careful records of each location are maintained in the usual way. In some companies the compilation of statistics, as to number of appliances connected, number of non-consumers, etc., is very complete. The following up of opportunities has, however, not been carried to the extent that I think it could be by the use of the tickler system, by means of which the opportunity card of the salesman is carried forward automatically through the office force.

Compensation.—There is a very great difference among the companies as to methods of compensation. Some pay a straight salary, others a commission only on the articles sold, others a combination of salary and commission. What is probably the most elaborate system considers, not only the value in gas consumption of the articles sold, but the degree of profitableness of the business with relation to the burden upon the plant capacity. No allowance, however, is made of the varying character of the districts, and for this reason the system does not seem to me absolutely equitable.

There is no doubt in my mind whatever that it is extremely desirable to offer to salesmen in this line of work, an additional incentive in dollars and cents, to develop the ambition of the men. I am inclined to think it would be possible to arrange a system which would be based upon the increase in gas consumption in a given man's territory over the previous year, the apportionment for commission to be made, not on the amount of increased income in dollars and cents, but on the relation that the percentage of increase bears to the total percentages of increase of all the other men in their districts. In other words, if one district showed an increase of 50 per cent., and another district showed an increase of the same percentage, even though the amounts of income were unequal, the 2 men working in those districts should have an equal share in the apportionment. In carrying this method to the ideal basis it would be proper to consider the actual degree of profit in the various kinds of business secured.

Industrial Fuel.—Where the industrial fuel field has been entered to the best advantage, a special department, organized to design, assemble and install special apparatus for this kind of work, has been established. Such a laboratory has proven very valuable, especially in familiarizing the salesmen themselves with the different kinds of fuel appliances which are introduced. In this way, if a new piece of apparatus is furnished to a certain house in a line of business it is possible for the salesman, knowing exactly how the scheme worked, to introduce the method in some other house in a similar line.

It has been maintained that in itself gas for fuel will not compete with coal or crude oil, except in intermittent work, either on the ground of economy in fuel or of labor. If, however, an appliance is designed which will do the work of coal or crude oil better than it was done before, gas will compete in continuous work as well, for the reason that no particular effort or ingenuity is being used in the matter of coal burning or oil burning appliances. The field, then, in this class of work, would seem to be along the lines of the designing of appliances especially adapted to the work in hand.

Judging from the reports in the West, I think that the gas companies in the East have not begun to approach the possibilities of the development of this field of industrial fuel.

How to Get More Business in New England.—It may not be admitted generally, but I think my investigations have shown that the Western gas man, the pioneer in the business of selling gas, has outstripped his Eastern friends. The question is, then, how to go to work to increase the sales of gas in the companies throughout New England.

The field may be broadly divided into: Residence and store lighting, industrial and domestic fuel, and power. I will assume that the formation of a sales' department has been accomplished, as this is the first essential to success.

First, as to Lighting.—Many of the companies in the West control the electric light industry as well as the gas, and it has usually been the custom not to push gas for lighting against electricity. Where, however, there is a competitive situation there should be a very large field for increases in the sales of gas for lighting.

Gas is a soft, well-diffused light, pleasing on the eye, of good, even quality, and cheap. In the past the principal disadvantages of gas have been the poor appearance and unadaptability of fixtures to artistic design and the inconvenience. I am a firm believer in the introduction of a better grade of gas fixtures. There is nothing else that has hurt the gas industry as a whole quite as much as the poor appearance of the fixtures that have been introduced. The economy of gas has been so over-emphasized that the user felt that the only reason he was putting up with gas at all was because it was cheap, and he has, therefore, attempted to economize equally on the cost of the fixtures themselves. The result has been that until recently the gas customer has been only awaiting the time when he felt that he could afford to spend more money for lighting and then put in electricity, and we have seen in all of our cities the most miserable exhibitions of dilapidated fixtures and broken mantles possible.

Now, that improved fixtures have been made possible, we are selling gas, not because it is cheaper than electricity, but because it is better; but the prejudice against gas had become so general that it is slow work to convince the public of its advantages aside from that of economy. This is the prejudice which leads a man to say that, although he personally thinks gas gives a better light than electricity, he is afraid to put it in his store because his customers will think that his trade is falling off and that, therefore, he has been obliged to economize on his light.

There is no reason in the world, within certain limitations, why the appearance of a gas fixture should not be as handsome and artistic as that of an electric fixture. It has even become possible to turn the light upside down, and fixtures have been designed to conceal the mantle and the burner completely from view. The development along these lines should be encouraged, and we will then look for the day when a man will pay as much for a gas fixture as he is willing to pay for an electric fixture. Even in the matter of convenience, great strides have been made. I have a 2-arm bracket fixture, set up in the exhibition rooms of the Gas Appliance Exchange, which is lighted by a spark-lighter. This is not the usual affair with its long burner and ratchet apparatus, but is an extremely handsome piece of work which no man would be ashamed to see in the most elegant home.

We should go more into matters of illuminating engineering. We should study the distribution curves of the gas lamps, especially the new inverted lamps, with a view to showing prospective customers how to lay out their lighting to the best advantage. We should maintain mantles on a cost basis. This maintenance should be applied to single mantles as well as arc lamps. Of course, it would be practically impossible to arrange this for isolated cases, but where there are 20 or more mantles in one installation it would be quite possible to establish a basis of care at the expense of the customer. I have already alluded to the many cases one sees of poorly maintained mantles. These are about the poorest advertisements we can have, and it behooves us to find some method of placing our light upon a more efficient basis, in spite of the reluctance of the customers to go to the expense of doing this themselves. If we could charge an additional sum for gas per 1,000, we could do all this maintenance work gratis, as electric companies do, but it ought not take very much sales' work to show a customer that the cost of maintenance is paid by him even with electricity, and that although our charges would have to be made separate there would still be a very large saving over the cost of electric lighting.

Domestic and Industrial Fuel.—The domestic fuel field is familiar to all the members, and I will not go into this question except to say that in one city in the West, where special attention had been given to the possibilities in the sale of gas ranges, it was found that, although there were sold in the year 4,000 or 5,000 stoves, there were always about 8,000 opportunities for selling more; the number of opportunities did not seem to be reduced on account of the sales which were made—the increase in population would not account alone for this fact—which would seem to show that there should be a constant field for increases in domestic fuel usage.

One interesting scheme is probably familiar to many of the members for encouraging the use of a gas stove all the year round. In the past it has been customary to build houses so that the kitchen would be heated in winter by the coal range. It is now customary for the new

building representative of the gas company to encourage the heating of those kitchens from the furnace direct. Where, however, this has not been done in the old houses, it has been found feasible to place a hot water coil in the furnace and connect to a hot water radiator in the kitchen, also to the hot water boiler. In this way hot water would be furnished constantly and the kitchen heated independently of the coal stove, and it would then become possible for the customer to use the gas stove in winter as well as in summer in these cases.

I have already mentioned the possibilities for industrial fuel. The appliances should be put in to guarantee satisfaction, the expense of piping to be paid by the customer, but appliances to be taken out if not wanted for any reason. If anything new is designed, advertise it and push it for duplication in other cases.

Power.—Gas can be sold for use in gas engines of large capacity, to compete with electricity and other sources of power. This has been demonstrated right here in Boston, where we have 290 horse power in use by the Boston "Herald" Company. Another plant of 450-horse power will be announced shortly. We are introducing the direct connected set, especially designed for electric lighting as well as for power. A number of department stores have gas plants and the Boston & Albany Railroad are just putting in an installation for their freight yards. I think if this matter were gone into more closely by some of the companies they would find possibilities in this field.

Advertising.—Advertising plays a very important part in the campaign for new business. I am a thorough believer in publicity through the daily newspapers, not only as a medium for the pushing of specific appliances but also as a means of telling the public what you are doing. Unfortunately we cannot let our good deeds always speak for themselves in the gas business, and it sometimes becomes necessary, when we do something for the public, to tell them about it. Not only when the price of gas is reduced, but whenever anything else of general public interest and of advantage to the customers is inaugurated, get right out into the daily papers and tell them all about it. I believe in taking the very best space or none at all, with a liberal amount of white space in between the printed matter. It is not necessary to advertise every day, but when once you start it is well to carry the advertisements along for several issues, changing the copy every day.

I am not in sympathy with some of the display work which I have seen put forth by some of the companies. There is so much illustrated that very little of the reading matter is gone over. I mean by that that everybody knows you can cook with gas, so there is very little use in putting in a big picture of a housemaid standing over a gas stove trying to show in that way how easy it is to take care of one. It would be far better to use some means of attracting attention, but to conceal the main subject so that the curiosity of the reader would be aroused and he would run through the whole of the advertisement.

In the West the "circularizing" of territory is carried to a very full extent, in some of the companies, by means of a card system. This is a very efficient way of backing up the work of the men, and, in connection with newspaper publicity, makes a very complete system.

Enthusiasm.—What is perhaps the most important factor in increasing the sales of gas is enthusiasm, and the Western companies have this characteristic developed to a very great degree. They and their men know that they have a good thing to sell, and they go right out and sell it, with that confidence which makes the salesman himself feel that the customer will be almost committing a crime to refuse to accept his proposition. We need more of this feeling in the East, not only among the salesmen but among all employees of the companies. We should all boom the company on every possible occasion. They call this "boosting" in the West. Anything that will encourage this spirit will help the business. The "get-together" spirit among all the various departments and an extra heavy dose of enthusiasm in the sales' force will bring results every time.

Discussion.

The President—Gentlemen, that is a very comprehensive and lucid paper on one of the most important features of our industry. The gas works having been erected and the plant in running order, the next thing to do is to sell our wares. We are very much indebted to Mr. Wrightington for his able argument and the meaty suggestions as to how to dispose of them. Mr. Learned, we would like very much to hear from you in connection with the paper just read.

Mr. C. A. Learned—The thoughts expressed by the writer bring us into the field of the gas appliance and present to us a good many open doors. Some of us in the smaller places realize that the force that is to be employed for this kind of work is naturally small. We can perhaps hire only 1 or 2 people to do this class of work; but that does not make it the less important. The fact that in some places one solicitor is put out for every 7,000 people would mean in the town which I come from 4 or 5 people working. Now, that seems to the man who is running the smaller plant perhaps a good many to work his district. It means for him that if he has not a special assistant in this line of work he must give a great deal of thought to it himself, and to people who are running a gas business and trying to look out for all of its interests, I must say that appears to me as confining us very closely to one department. But where perhaps 1 person is provided for 10,000 to 12,000 inhabitants it is very certain that that is not too many in order to cover the district carefully. I think most of us will have to admit that this part of our business is not being carried on as systematically as the manufacturing of the gas. It is one of vital importance, one which is coming up to us every day with accelerated interest, and one to which we have got to give increasing attention. The paper brings out so many points of interest touching on all of the lines, that it makes me feel, as an Eastern man, that we are rather behind the game as compared with our Western neighbors, that we have not quite enough of the "boost" he speaks of, that we are lame in many ways, and no one can realize it better than Mr. Wrightington, after having gone into the West and talked with these people who are pushing things for all they are worth. You know we are New Englanders, and we are real conservative; but it is very apparent that in a very short time we have got to get out of this lethargy, or else we will not be wanted by our companies. I wish to compliment Mr. Wrightington on his excellent paper.

GOVERNOR GUILD'S GREETING.

The President—The Association will be at ease for a few moments. Governor Guild has promised to join us and greet you. [Governor Guild entered the meeting room amid great applause, everyone rising.] Gentlemen of the Association, we all feel very highly honored by the presence of the Governor. We recognize the graciousness of the act when, during the press of business and the many duties connected with his official position, the Governor comes here to greet us. I present his Excellency, Curtis Guild, Jr., Governor of Massachusetts. [Great applause.]

Gov. Guild—Gentlemen, I am very sorry there should have been any misunderstanding about my appearance at your dinner to-night. There evidently has been. This is the occasion of the annual meeting of the Division of Massachusetts, Grand Army of the Republic, and the portion of the day not sacred to the Sons of Veterans, Grand Army, Woman's Relief Corps, and the various other organizations connected with the veterans, is taken up by such minor matters as the meeting of the Governor's Council, important appointments, and the arrangement of certain legislation for the Commonwealth of Massachusetts [Laughter]. Consequently it is impossible for me to come to you this evening, greatly as I should like to do so. It is a great pleasure to come here now, even for a few minutes, in order to extend to you the most hearty greetings of the Commonwealth. As one who has had a somewhat prolonged experience in campaign oratory I suppose I ought to be an authority as a gas engineer [laughter]. Otherwise I am afraid I could not qualify as an expert. Two departments in the public works (public lighting by gas and by electricity) are annually assuming greater and greater importance in our public affairs, and as they increase we find that fair play to the public, fair play to the corporation, is more and more demanding government regulation, honest regulation, and investigation by experts who are neither swayed to the one side nor to the other from honest opinions based upon accurate technical knowledge [applause]. That is the sort of service that Massachusetts should have; that is the sort of service that the people of the United States should have. In that work we expect, and I am sure we shall receive, the assistance of your honorable profession, a profession as important as it is honorable. In the assurance of that cooperation for the general good of the public I wish every success to your deliberations, and a more hearty entertainment after your banquet this evening than could proceed from the jaded brain of a willing but weary public official. [The members rose as Governor Guild retired from the hall.]

The President—We would like to hear from Mr. Scranton, following the lines indicated by Mr. Wrightington in his paper.

Mr. G. H. Scranton—I don't know that I can say very much regarding the paper. The number of canvassers in a town I think depends altogether upon whether the town has been worked, or whether it is a new town or a small town. Take, for instance, our town of about 28,000 people. At the present time one man is ample to canvass the town, I think, thoroughly. He has been in the employ of the Company for several years. He knows every family that has a gas range, and in canvassing for a gas range he only goes to those that have not, conse-

quently it takes very little of his time. I don't know that there is anything further I could say in regard to the paper.

The President—Has any other gentleman anything to add to what has already been said on this subject?

Mr. Morrison—I would like to emphasize one portion of the paper. The writer speaks of the frequent finding of burners in poor condition, poor mantles and poor lighting, and I should like to bring out the fact that if the domestic and fuel appliances in use generally were inspected systematically and regularly probably the same condition would obtain. You would find appliances which were in an unfit condition to run, which were not being fully used, or possibly not used at all, owing to lack of education, or knowledge, or some defect. To my mind it is very important, not only to canvass and to sell, but to regularly inspect and educate the people how to use what we sell them. I think every company should have a professional cook to follow up the canvasser, follow up the installation, and to see to it that the people are educated to use the appliances, not only to use the top burner, but the oven burner and every burner that is made to be used. The result of such inspection will be twofold. It will increase the satisfaction of our consumers; it will increase consumption, and decrease the cost of getting new business.

The President—I think Mr. Morrison has sounded a proper note, that after the apparatus has been installed it should be followed up. I really think that in a great many of the stoves the majority of the companies have in use very little is made of the oven burner. The stove is used nine-tenths of the time on the upper burner, and the oven and the broiler are comparatively little used. We have one with us that we would very much like to hear from—he is not a member of the Association, although he certainly would make an excellent member with his wide experience—Mr. Clark, of New York. We welcome him here, and would gladly hear from him. [Applause.]

Mr. Clark—Mr. President and Gentlemen of the Association, I think Mr. Wrightington has covered the subject so well that he has left very little for me to suggest. I think it is of vital importance, as suggested by Mr. Morrison, to emphasize the fact that the maintenance is a part of this scheme which should be carried out with as much enthusiasm as the installing. This is vital in the matter of domestic appliances. It becomes very apparent when a light is not up to efficiency, but the trouble in the kitchen range is not likely to come to our attention. We have to invite those troubles if we wish to keep efficiencies right. In New York we have a system of inspection by women demonstrators, who have been on our force for some 5 or 6 years. They were schooled for their work by having attended cooking lectures given by an expert cook, who was at the time we had our lectures to our women giving public demonstrations in one of our sales rooms. These women are given inspection cards, and they make about 18,000 or 20,000 inspections every 12 months. Their work consists of teaching cooking from an economical and hygienic view point as well as looking after the efficiency of the appliances. Such inefficiencies as may be beyond their remedying they report back to our shops; that is, anything aside from a minor adjustment. If an appliance requires a fitter's attention it is reported to our shops and we send our stove man to make repairs. We find that it pays us to keep efficiencies right. We have a floating population in New York, so that we can canvass every spring and find thousands of newcomers to the city. When I was in charge of the dwelling district—that is a district of flat dwellers—if the locking and unlocking of a meter represented the moving of a tenant it would indicate that there was an average of 104,000 consumers in 11 months, so you may judge of th field that is open to us to canvass. We have a regular canvassing force that we carry through the year on a salary and commission, but we lift ourselves over the peak of the load every spring by putting on what we call floaters. These people are also paid salaries and commission. There are local conditions, of course, in the commercial question that must be met by the man on the ground. For instance, one class of consumer in New York that is very hard for us to reach, in the instance of getting cooking appliances installed, are the occupants of the high-class private dwellings in the vicinity of Central Park, establishments that represent all the way from $10,000 to $25,000 a year, perhaps, to run. Those the canvassers hardly ever get access to, because they are always met at the door by servants who decline to allow the canvasser to see anyone in authority to whom he could state his proposition. We propose reaching those people if we can by a circular letter, showing in it that the servant problem can be met and solved in this way, that the servant in the kitchen is made more comfortable in doing the cooking in a flat which rents for $25 or $30 a month than in a house that rents for $10,000 or $15,000 a year. We hope to impress that point upon them by some kind of a circular letter.

The President—We are certainly indebted to you, Mr. Clark, for your remarks. They were interesting and very much to the point. We would like to hear from any other gentleman who has facts that he would like to present.

Mr. Gardiner—Mr. President, I have been very much interested in Mr. Wrightington's paper as a digest of a number of active companies. It seems to me this new business problem or sales' department problem is considered by companies who have not as yet organized these departments primarily from an expense point of view. We are operating on a certain basis; we are just about making two ends meet. Now, we don't want to go into our pockets to meet the expense on this new business campaign. I never believe in keeping net earnings down for the sake of saving in operating expense. I think that is bad policy. The experience of companies that have broadly and fully carried out these new business departments has shown that they are money makers. Another thing that stands in the way of a company in going into this new business department work, they may deem the expenditure advisable, and they have been told in many papers and discussions by their Associations how these departments are run, in detail and in principle; but we know from our engineering experience in operating the works that it is one thing to read about a thing being done and to be told how the other fellow did it, and it is a very different proposition to do it one's self. This is especially the case, I think, in such an intangible thing, or a thing which seems so intangible at the outset, as the new business department. Just exactly the ways and means and detail which will make it successful are matters which we approach with a great deal of diffidence. One of the vital things to success, as Mr. Wrightington pointed out, is enthusiasm and co-operation, not only among the new business men, but between the new business department and all other departments of the company. Occasionally it is thought that the sole object of a new business department is to increase the revenue of the company. It is thought sometimes that the purpose is to do this irrespective of anything else. I think those departments which are most logically operated are the ones in which it is insisted that no sales shall be made unless it is to the benefit of the customer to purchase. In other words, each sale is effected individually on the basis of a square deal, additional service to the customer and the public in the aggregate. I believe that operating new business departments on that basis brings about a mutual esteem between the individual customers and the company, which results not only in increased business and increased earnings but in increased security, which is a very important factor nowadays.

The President—Among other questions in the Question Box is one which, as it is pertinent to the discussion that is before the Association, I will read. It is as follows:

> "For the large company which is for the best all-round advantage, daily or monthly reading of meters?"

And another:

> "Should a gas company engage in selling merchandise, such as portable stoves, etc., when same are handled by other dealers?"

What say you, gentlemen? Now, Mr. Barnum, can we get you to answer that second question: Shall a gas company engaged in selling merchandise interfere when it is handled by other dealers?

Mr. Barnum—The one point brought out in Mr. Wrightington's paper, namely, that price does not make as much difference in the sales as do enthusiasm and other factors, strikes me as very important indeed. I agree with him that it does not.

The Secretary—Mr. President, I think that circumstances frequently alter cases, and what will work in one place in another place will not work. I think that in some sections you will find that the merchants, for instance, from the looks of their stores, have about all they can do to pay their rent and their gas bills, without going very much into investment on account of appliances. In other places, like the West, perhaps, and places not far west from Boston, they apparently have money enough so that they can pay their rent bills and their gas bills and still afford to buy new appliances. I admit that a good salesman can sell most anything, and I am told by some experts that a successful salesman of gas appliances wants to be considerable of a fakir, though from the point of view of the man who has to sell the gas that is going to be burned in the appliance I very frequently think that the gas seller has got a great interest in how that fakir business is worked. All of you have seen the results of the gas appliance fakir, not only in gas governors but in gas burners, and you probably have all had occasion to investigate complaints of poor gas, where there was no earthly reason except poor or abused appliances. As I said before, in some I think the gas company ought to have the selling of the appliances in their own hands; in other places, where they can get some-

body else to do it and do it satisfactorily, I think we are all willing to share our burdens with any other party who will do it better than we can. I was interested in some of the points brought out by the reader of this paper, especially in the reference to the appliance expert. I know of instances where inquiries are made regarding an appliance to do a certain kind of work and the information is not forthcoming. For instance, a confectioner wants a burner to give him a tremendous heat to heat up a kettle of his goods in a quick time, and also to bring it to a very high temperature. He buys a gas burner, thinking that gas will give him a quick and nice heat, and perhaps not be too expensive, and puts it in, and finds it takes him about twice as long to boil his batch as it would with a coke fire. Then he wants to know why, and if there is any better burner, or if he has to have a forced blast, etc. If we have somebody who can give him that information, and show him where he can get the appliance that will do his work, we may nail him. On the question of maintenance and the advertising we get from poor burners, I think that is more than a burning question, because you all notice them. You will find mantles that may be burning, but they are giving very little light. You ask those people to buy better mantles, and they say, "Why, I just put on new mantles last week, and now look at them." That is where the result of the fakir has come in. He has sold this party a new set of mantles, perhaps for 15 or 20 cents apiece, that are worth about 2½ cents. I have in mind an instance where a man had two arc lamps in his store, and I happened to be in the store and looked at them and remarked on the condition. "Why," he said, "only last week I had those put on new." I don't know what he paid for the mantles, but I hope not very much. I told him if he would allow me I would send a man down and put on some mantles, and if they did not last more than a week to have some more put on. I can't say now how long ago it was, but several months. I have noticed those same mantles giving pretty good light, and every time I have been by the store I have noticed that the arc lamps have been burning. I think the most successful canvassing I ever did was when I employed a gentleman who had had a great many years of experience in the gas business, and sent him out to take streets right straight through, go to the houses and look over their appliances, sell them mantles if he could, if they needed a few Bray burners put them on, and say nothing about it. I think he earned his money, though he did not sell a great many goods. The question of cost of maintaining mantles in single lamps is one I should like to have information on. Some figures which were handed to me may not be without interest. A dry goods store had been lighted by electric lamps. I don't think they could afford to pay for them. The proprietor flatly refused to pay for any appliances. Fifteen gas arcs and 20 single Welsbach mantle were put in. The cost of the installation was $101.27, and for the first 3 months the cost of maintenance on two monthly inspections was $10.73. There was charged to him, for care and a few appliances that he wanted extra in the way of smoke shades, for that period $24.99, so that at the end of 3 months there had been $87.02 net expended on that outfit. The Company had sold 130,400 cubic feet of gas, and they still owned the burners, and they were still burning gas. That, however, does not answer the question what it costs to maintain single lamps.

Mr. Barnes—Mr. President, in connection with selling gas appliances by gas companies an interesting question was put up to me the other day, and I will put it up to the Association: How many gas companies are authorized by their charters to do a hardware business?

The President—Now, gentlemen, don't answer that question all at once. How many have a special clause in their charter? I should like to ask Mr. Barnes another question: Is there any law to prevent a gas company selling hardware?

Mr. Barnes—Well, it was put up to me in this way: That a corporation chartered by the State can only do such things as it is enabled to do by its charter, and if the company is chartered to manufacture and sell gas that is the limit of its power. I don't know that that has ever been ruled upon. I might say that if that is the law I am violating it every day.

The President—Our Rhode Island charter gives us the privilege of selling appliances. I think that would come under that head. Do any of the gentlemen in Massachusetts know exactly what the clause is in their charter? We have Commissioner Barker with us. Mr. Barker, can you illumine that question for Mr. Barnes, of Cambridge?

Commissioner Barker—Mr. President, when I heard Mr. Barnes say what he did I had suspicions that he did not know I was here. (Laughter). It rather surprised me otherwise to see a man stand up and admit, or suggest even, that he is violating the law. I suppose the question involved is as to the correct principle to be applied in construing the charter powers of the companies. My impression is that the courts in this State have been disposed to give a rather liberal construction to the charter powers, at least to this extent, that a company is authorized to do whatever is necessarily and properly incidental to the expressed purpose, and I suppose the question of the right to handle gas appliances must be dealt with under some such proposition. If it is necessarily incidental to the sale of gas and the proper supply of the public that something should be done by a company in the direction of supplying the facilities for using that gas, I think there may be a very strong claim made that that is incidental to the charter powers. I think it is at least upon that proposition that companies engage in that business, even though it may not be expressly stated in their charters that they may do. It is pretty difficult to tell 25 or 30 years ahead just what things may become incidental to the general power of the gas supply. The charters in this State are, most of them, very broad in the statement of their purposes; that is to say, they are general rather than specific. Sometimes a corporation lawyer in seeking a charter sets out a large number of things in detail, but it has always seemed to me that that was a very unwise thing to do from the point of view of the holder of the charter, because the court is more likely, I think, when things are set out in great detail, to restrict the company to those detailed things and to be less liberal with respect to the incidental things than if the charter is general in its character, as the court must then pass upon the question as to what is incidental to that general power. It seems to me that the common position of the companies, in this State at all events, is that such work is incidental to their general powers, and they have accordingly the right to undertake it.

The President—I thank the Honorable Commissioner for his clearance papers for Mr. Barnes, who I suppose will rest easier, now that he knows he has not broken the law. Is there any other gentlemen who would like to say anything to the question?

Mr. Coggshall—I would like to say a word in relation to these matters. I can take a great deal of encouragement from what has been said. We are selling power in our case, and I did not find anything in our charter which gave us the right. It is incidental merely. But in relation to the matter of selling appliances by gas companies, a few years ago we sold perhaps 25 or 30 stoves a year. Some were sold by the commercial men in the city. I went out to see my friend Waldo, at Malden, and found he was selling appliances and putting out gas stoves four or five times more than I could. I went where he bought his fixtures, and made arrangement for such fixtures as they supplied. I selected two patterns of fixtures, one that I could sell for $13, giving light for four rooms, one for $18, giving light for six rooms, and we commenced the business and canvassed the place. To-day we sell all the fixtures that are sold in the place, and we are doing all the piping that is done in the place. We are running in the summer season 6 teams, 2 men on a team, putting out gas stoves and setting meters. In the winter we find, of course, a great may of these places where we had set meters for stoves that did not use gas for light. We canvass some during the winter season for piping, and we keep 4 to 6 teams running all through the winter in piping the houses—in fact, we are doing all the work that is done in the city of Fitchburg—and selling gas stoves. A man asked me the other day if we had anything in our charter that permitted us to sell, and we told him the gas companies did it, and we supposed we had, and we still continue the business.

Mr. T. J. Cunningham—Mr. Chairman, If I might be allowed to add one or two words to this discussion, I would call attention to what some people in the business consider a very important action recently taken by the Council of a large Western city. The case was simply this: The gas company had been very active in the disposing of gas ranges and other means for consuming gas for cooking and heating, and so on, and had made such great inroads upon the sales of those articles by the local stove dealers—that is, the ordinary coal and wood stove dealers—that the dealers applied to the City Council, asking them to pass an ordinance declaring that the gas company had no right, in fact, that they were going beyond the provisions of their charter, or were exceeding their legal limits in attempting to so dispose of such property. The matter was referred to the City Attorney for consideration, and he reported back that, from his point of view, the company under its charter had a perfect right, not only to rent but to sell, and the matter was there dropped. This happened within the last 6 weeks. [Applause.]

The President—That I think covers the point very nicely, gentlemen. Now if there is nothing further to be said along those lines the Secretary has a question that he will read you.

The Secretary—Mr. President, before I read the question, if nobody else does it I would like to move a vote of thanks to Mr. Wrightington for his paper. I exerted considerable personal effort to get him to write this paper. [Adopted.]

The President—It gives me great pleasure to extend the thanks of the Association to you, Mr. Wrightington, for your very interesting and useful addition to our gas literature.

(To be Continued.)

Lighting of the Offices of the Consolidated Gas Company, New York.

[A paper read by Mr. Wm. J. Clark, at the March Meeting of the Illuminating Engineering Society.]

Pursuant to an announcement that this meeting was to take the form of a symposium, at which the lighting of large interiors would be discussed, I took this as a license for the layman to briefly hold forth, and my remarks will be confined to a brief resume of some of our office lighting. I purposely avoided the term illumination, as I know of no instance where the illuminating engineer was consulted in this most important matter, and I hope by reason of this omission to accentuate the necessity of having the architect and builder and subsequent occupiers of premises benefit by the valuable suggestions of this comparatively new specialist.

The buildings which gas companies occupy for office purposes are either rented premises, not specially designed for such purposes, or buildings owned by the companies, the building of which antedates the advent of the illuminating engineer, so that we approach the lighting problem with one of its chief difficulties very apparent, that of the irrevocably fixed points at which the radiants must be placed. I find

in Dr. Bell's "Art of Illumination" this paragraph, which emphasizes the point I am trying to make:

"If electric lights had been in use for centuries and the candle had just been invented, it would be hailed as one of the greatest blessings of the century on the ground that it is absolutely self-contained, always ready for use, and perfectly mobile, and this last named admirable quality is one in which it solves one of the most difficult problems of illumination. Of course, it would hardly be reasonable to recommend at this day and date the adoption of candles or lamps for any areas where gas lighting and electric wiring can be done, and they would prove wholly inadequate in large areas, but even these crude types of radiants still possess some advantages over the more modern ones."

As to the offices of the Consolidated Gas Company, take the case of the Irving Place Branch. This building is over 50 years old and has passed through many of the transition stages of gas lighting; in fact, the story of its equipments would be a resume of all the types of burners used in 50 years. In the remodeling of the building some years ago, evidently no thought was given to using large unit radiants, as no provision was made for ceiling pendants, the lighting being done from a purely utilitarian point of view, the means being two arm standards on the individual desks. Of course, the general illumination was poor, the light being reflected downward by metal shades from a plane about 5 feet from the floor. This left the 13 feet to the ceiling above this light plane in semi-darkness and presented a poor and unsatisfactory appearance. These desk standards at one time were equipped with Welsbach lamps, one on each arm, but the difficulty of maintaining them, owing to the constant jar caused by the handling of large, heavy ledgers, led to their discontinuance, and the flat flame burner was again installed. These are now largely out of use by reason of the installation of gas arcs, as shown in Fig. 1, and the ground and elevation plans, Fig. 2.

Fig. 1.—Irving Place Office, Consolidated Gas Company, New York.

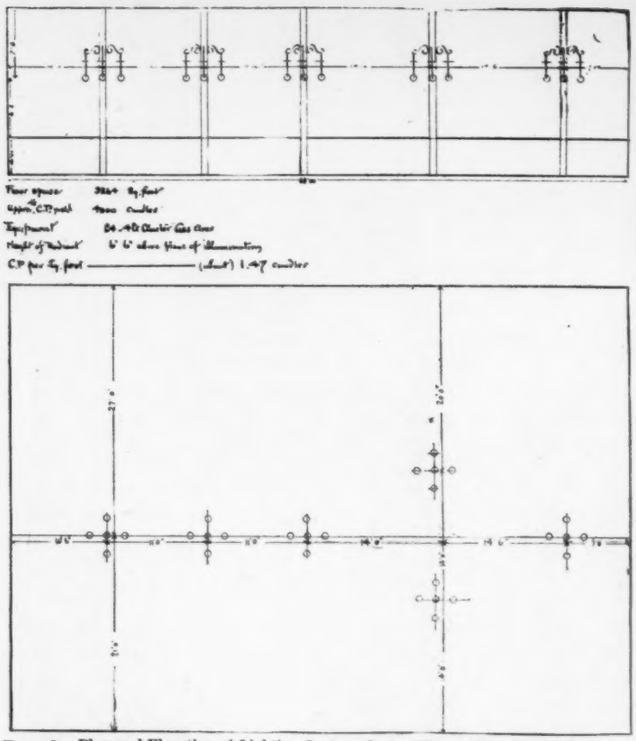

Fig. 2.—Plan and Elevation of Lighting System, Irving Place Office, Consolidated Gas Company, New York.

This equipment consists of 6 groups of four 4-light gas arcs, hung from the 8-inch diameter iron columns. The floor area of the room is 3,2[illegible] square feet, and the candle power yield of the radiants is approximately 200 candles for each lamp; or, say in all, approximately 4,800 candles, giving, if equally diffused, a yield of say, 1.47 candles per square foot. Of course, much of this light is wasted in the grouping of the arcs, and the actual spherical candle power of the cluster would not hold up to this rate of efficiency. Moreover, the walls afford little, if any, reflective diffusion, the ceiling being in a dark oak paneling effect, and the side walls and trim very dark. Notwithstanding these disadvantages the light is sufficient to admit of discarding the use of the desk standards. The efficiency of these lamps is taken care of by a maintenance company which looks after glass and mantle renewals as well as adjustment.

The Forty-second street office is in a more modern building, and the ceiling drops are fairly well distributed for general illumination. Here we have installed 31 gas arcs of the same type mentioned above, with a candle power yield of approximately 6,200 candles, with a floor space of about 9,700 square feet, approximately .639 candles to the square foot. The ceiling is 14 feet high, and that, as well as the side walls, is nearly white. These conditions, with the better distribution of the sources of light, make the lesser candle power per foot, as compared with the Irving place rate of 1.47 per square foot, much more effective. These lamps are not grouped in the Forty-second street office but hang about 15 feet between centers, running north and south, in a 200-foot long room, and from 18 to 24 feet between centers running east and west. In lighting this space we found the old difficulty facing us of the fixed points for the lamps. In laying out our floor space the first consideration was the facility with which the business could be handled at the points where the public is to be accommodated, providing ample room to handle large numbers at one time, ample passageway and partitions for department purposes. After all of this was planned for, the arrangement for lighting was taken up with the result that the ceiling pendants were in hit-or-miss places. However, as shown in the photograph, Fig. 3, and plan, Fig. 4, the result is no

Fig. 3.—Forty-second Street Office, Consolidated Gas Company, New York.

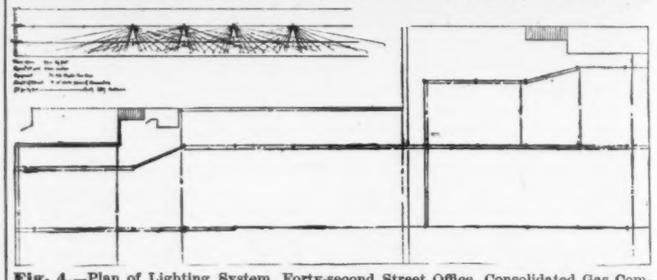

Fig. 4.—Plan of Lighting System, Forty-second Street Office, Consolidated Gas Company, New York.

bad and the general illumination rather good, but desk lights have to be used in the bookkeeping department for specific desk lighting.

We have tried one or two intensified pressure systems with more or less satisfaction, noticeably the Sugg system, burning the gas under a pressure of 8 inches of water, with a candle power yield of upwards of 30 candles per foot of gas consumed. This system, largely in vogue in London, is an active competitor of the electric arc for the illumination of large areas, both indoor and out. With this and the Keith intensified lamps many electric installations have been displaced. These systems are very little used in this country as yet, but their projectors look upon this as a promising field for promotion.

One of the evidences of the tendency of the time toward large, in-

tensified units is apparent in the equipping of armories and markets with arc lamps in place of the strings of piping carrying flat flame tips. One has only to walk up the East Side avenues, New York, to be impressed by this. In former years almost every corner market or provision store was equipped with these string lights. In fact, the running of these outside strings was a part of our shop work, which was assigned to a special force, so generally was it used at one period. This method of lighting has almost entirely disappeared now, the more sightly or economical arc lamp having taken its place.

I submit this brief paper in accordance with an understanding that it was not to be an attempt in any way to expound any technical point or to advance any scientific suggestion, but simply to bring before the meeting a layman's view of the very great value it would be to everybody concerned if the illuminating engineer could be brought into closer touch with the architect, builder and fixture man, and last, but not least, with the decorator.

Primitive Public Lighting.

Away up in the wilds of Northern Ontario, at Dorset, in the section of Canada famed as the stalking ground of the deer hunters, one still finds in vogue the custom of the town night watch with the lanthorn.

This is a curious survival of the ways of our English ancestors, which date even further back than the times of good Queen Bess. Shakspeare many times wrote of the men who brought in the lanthorns, and while the Dorset lantern may not be as primitive as the Shakspeare examples were, still it is of the good, old-fashioned sort our grandfathers used in this country.

The photograph shows the town watch about to ride off for a night of "rounds," with his precious lantern (symbol of authority) in his hands.

Light and Illumination.—No. II.

[A paper read before the New York Section, December meeting, Illuminating Engineering Society, by DR. CHARLES P. STEINMETZ.]

Until a few years ago, until the development of the Welsbach gas mantle, practically all methods of producing light were based on incandescence. That is, by impressing energy on a solid body, either the chemical energy of combustion, or electric energy in the incandescent or carbon arc lamp, the temperature is raised to such a high value that among the total radiation issuing from the heated body a certain very small percentage appears within the fraction of an octave of visible light. With increasing temperature of the radiating body, the average wave length of radiation decreases; that is, the average frequency of radiation increases, and so approaches nearer to the visible range, although even at the very highest temperature which can be produced the average wave length of radiation is very far below the visible. This means that the higher the temperature reached by an incandescent body, the higher is the average frequency of radiation, and so a larger percentage of the total energy of radiation is within the visible range and is light. Thus the problem of efficient light production by incandescence is the problem of reaching as high a temperature as possible in the luminous body. In the gas flame and the kerosene lamp, this temperature is the temperature of combustion, and is rather limited. In the incandescent lamp it is limited also. In the latter case the temperature which can be reached is limited by self-destruction of the incandescent body.

Probably the highest temperature which can be reached is the boiling point of carbon; it is reached in the crater of the carbon arc lamp, and, therefore, the carbon arc gives the most efficient incandescent light. It is incandescent light because it comes from the incandescent crater and the arc flame or the vapor conductor does not appreciably contribute to the amount of light issuing from the lamp. Very much lower, necessarily, is the temperature of the carbon filament of the incandescent lamp.

The problem is to find materials which can stand very high temperatures, to increase the temperature of the gas flame as well as of the incandescent filament. The temperature of the gas flame has been increased by using a gas of higher chemical energy, as acetylene. The acetylene flame is white; the ordinary gas flame is yellow.

The temperature of the carbon filament has been increased by replacing the carbon with some more refractory material, such as tantalum, osmium, tungsten, etc., and thus a higher efficiency is obtained. The temperature of the gas flame may be increased by increasing the rapidity of combustion. The temperature of the carbon filament in the incandescent lamp may be increased by increasing the energy input, but if the temperature of the carbon filament be increased, it is more rapidly destroyed. The temperature of the gas flame has been increased by more rapid combustion to a certain extent by having the gas issuing, not from a round hole, but from a flat slit, so as to give a larger surface to the flame. By going still further and mixing the gas with air, a still higher temperature and a more rapid combustion are obtained, but the incandescent body is destroyed, because the incandescence of the gas flame is the light given by carbon or heavy hydrocarbon particles floating in the gases of combustion. The efficiency of the gas flame may be increased by mixing the gas with air, as in the Bunsen flame, but it is then necessary to insert a luminous body of some other material in place of the carbon produced by the gas by its dissociation. This may be done by a skeleton of platinum wire. In no case, however, can very high efficiencies by incandescence be reached, because of the temperature limit.

However, the efficiency of light production might be increased if an incandescent body be found which does not radiate in the same manner as the carbon filament or the so called black body, but which gives an abnormally low radiation in the low frequency range, or an abnormally high radiation in the high frequency or visible range. Such a body may be said to give selective radiation, because the distribution of energy amongst the different frequencies of radiation in the spectrum is not the same as it would be with an ordinary black body at the same temperature. If a body be found which gives an abnormally low radiation in the visible range, or abnormally high radiation in the invisible range, this body would be an abnormally inefficient light producer. Inversely, if a body give abnormally high radiation of short wave lengths in the visible range, or abnormally low radiation of long waves of low frequency, this would be an abnormally efficient incandescent body. Such bodies exist and the enormous progress in gas lighting made by the introduction of the Welsbach mantle is based on such selective radiation; that is, the oxides do not radiate the same range and intensity of waves as a black body, the incandescent carbon, but give an abnormally large amount of visible rays compared with invisible rays; that is to say, they give a larger percentage of high frequency light rays compared with the low frequency invisible rays. Possibly, and even probably, some of the highly efficient metal filaments, like the Tungsten filament, also owe their high efficiency of 1 watt per candle power to selective radiation.

When discussing selective radiation, it is necessary first to come to an agreement on what is understood by selective radiation. The question whether an illuminant owes its high efficiency to selective radiation, depends largely on the definition of the term "selective radiation." This is a case similar to the much discussed problem of the "counter electromotive force of the electric arc." Whether the electric arc has a counter electromotive force or not, entirely depends on the definition of counter electromotive force. In the same way the decision on the question of selective radiation depends on what is defined as selective radiation. If selective radiation be defined as any radiation in which the intensity of radiation is distributed through the total spectrum differently from that of the theoretical black body, then the Welsbach mantle shows selective radiation. If, however, selective radiation be defined as the radiation of a body which gives spectrum lines, or bands,

or absorption lines and bands, that is, sharply defined narrow ranges in the spectrum, of abnormally high or abnormally low intensity, then the Welsbach mantle shows no selective radiation. So all discussions and statements on selective radiation have rather little meaning if the writer does not give his definition of selective radiation. In the following I define as selective any radiation which differs in the distribution of its intensity from the radiation of the theoretical black body.

In an incandescent lamp filament a definite pitch, or definite frequency of vibration, is not given, but there is an infinite number of different waves. The reason is, perhaps, that in a solid or liquid body the vibrating particles are so close together as to interfere with each other. If a body could be set in vibration, in which the vibrating particles, atoms or molecules, are so far apart as not to interfere with each other, as, for instance, in a gas at low pressure, then they would execute their own periods of vibration, and the light from such a body would not be a radiation of all wave lengths, but a radiation of only a few definite wave lengths, or a line spectrum. Thus incandescent or luminous sodium vapor gives only one kind of light, a yellow spectrum line, and in addition thereto a number of infra-red and ultraviolet rays.

Since the spectrum light is based on the non-interference of the vibrating particles, it is easy to understand that when the atoms or molecules are brought closely together, as at atmospheric pressure, interference may begin, and the lines of the spectrum become confused and blur into bands. Thus the mercury arc spectrum, which is at low vapor pressure, consists of a small number of definite sharply defined lines. In the calcium spectrum of the flame carbon arc there is a large number of lines blurring into each other and forming an almost continuous spectrum; so it is also in the white spectrum of the magnetite-titanium arc.

When a gas or vapor is set into vibration, it vibrates at its own frequency, independent of the temperature, and it is merely a question of the character of the material whether a very large percentage of the total energy of radiation happens to be within the visible range or outside the visible range. Temperature does not come in as a factor, because the frequency of radiation is no longer a function of the temperature, but is independent of it; sodium vapor gives the same frequency of radiation, the same yellow line when the sodium vapor is at low temperature or at high temperature. Some spectrum lines may increase in intensity with an increase of temperature faster than others, and the color of light may change with the temperature, may change from yellow to white or blue, or from green toward white or red, as the mercury light does with increasing temperature, but that is merely a characteristic feature of that particular body, and not a general temperature effect. The possibility therefore exists of finding materials which, when energized as vapor or gas, give a spectrum with a large amount of energy in the visible range, thus giving an efficiency of light production far in excess of that available by incandescence.

So far the only materials which give these characteristics are mercury, calcium and titanium. These three metals give spectra which contain such a large percentage of the total radiation in the visible range that the amount of light measured physiologically in candle power is far in excess of that which possibly could be produced by incandescence, even with the assistance of selective radiation. Their industrial applications are represented by the mercury arc, the yellow flame carbon, and the white magnetite-titanium arc lamps, and these have a higher efficiency than any incandescent lamp.

Considering these three illuminants only, there is a considerable color scale; from the orange-yellow of the flame carbon, which is about the longest wave length which could be used, to yellow and yellow-white in the acetylene flame and the tungsten filament. Then there is the greenish-yellow of the Welsbach mantle, due to selective radiation. Next are the bluish-green in the mercury arc, the yellowish-white of the carbon arc, and the clear white of the titanium arc. Each of these can be modified. The titanium arc may be given all colors from yellow-white to bluish-white by the addition of materials which give either yellowish or bluish spectra. The yellow calcium arc may be modified from the orange-yellow of calcium fluoride down to the yellowish-white of calcium borates. It is possible to get nearly any color, with the exception perhaps of a clear blue or violet; no means have been found to get approximately the same efficiency in these colors of very short wave length.

This feature makes the effect of color discussed before, the variation of the physiological effect with the brilliancy of illumination, of more importance now than years ago when the only method of producing light of any color was by the absorption of all other colors.

After all, however, it is not light that is wanted but illumination; it is not the amount of visible rays issuing from the source of light, the incandescent lamp or gas flame, which is of importance, but the amount of light which reaches the objects desired to be seen, that is, the illumination produced by the light. In this respect, a mistake has been made for many years, by the gas industry, as well as the electric lighting industry, by devoting all energy to the production of light, to the development of the lamp, while it was left almost entirely out of consideration that the production of an efficient light is not the only important problem, but of equal importance is the arrangement of the light so as to get efficient illumination; that is, to get the greatest benefit from the light produced. This feature has been usually left to the tender mercies of the architect or the decorator, who placed the lights wherever he thought they would look artistic. Everywhere there are cases of artificial illumination where the lamps have been arranged so that they give a very poor illumination from a large amount of light. It is the object of this Society to overcome these defects, to study the problems involved between the production of light and the physiological effect produced by the light on the eye, and it requires as careful study as any other engineering problem. It is of importance to consider, not only the amount of light issuing from the flame, but the amount of light which reaches objects to be seen by the illumination.

The demands of illumination are mainly of two classes, general illumination and local or concentrated illumination. Many places require general illumination, as a meeting room, where it is desired to see equally well everywhere; that is, to get the same intensity of illumination throughout the whole illuminated area. This is also the case in a draughting room, a school room, the hall of a house and the streets of a city. A uniform fairly high intensity is needed in a draughting room or school room, an intensity relatively low but as nearly as possible uniform in the streets of a city. It is true, street lighting is usually very far from uniform, but that merely means that the problem of proper street lighting is usually not solved in the most efficient and satisfactory manner. In other cases concentrated lighting is required, as in domestic lighting, in the dining room, the living room, etc., where light is desired on the table for working, eating or reading. In such cases, the general illumination of the room is of lesser importance and is not needed to any extent, or is frequently undesirable, because a room with a very low intensity of general illumination frequently is considered more homelike, especially by the feminine part of the human race. In still other places general illumination may be directly objectionable, as in a sick-room. Most cases, however, require a general illumination of moderate intensity, and a far more intense local illumination, as over the desks in an office, or the reading tables in a library. In such cases merely a general illumination would be sufficient if very intense, but this is uneconomical and to some extent objectionable on account of the blinding glare, which is disagreeable. Therefore a combined general and local illumination is more efficient and more satisfactory.

In producing illumination either direct lighting or indirect lighting may be used. That is, the rays issuing from the source of light may either pass directly to the illuminated objects, or they may pass to a reflecting surface, and be reflected from this surface to the object, or they may pass through a refracting body, as the frosted incandescent lamp globe, or the opal globe of the arc lamp, and so reach the illuminated object. In general, it is obvious that any method of indirect lighting by refraction or reflection wastes a considerable amount of light. That means, the total amount of light which reaches the illuminated object must necessarily be less with indirect lighting, as compared with direct lighting, with the same total amount of light.

Indirect lighting can be done by reflection or refraction by some attachment to the lamp, as a reflector or a holophane or frosted globe, or by reflecting the light from the ceilings and walls of the room on the objects to be illuminated. In the latter case it is obvious that white walls give the highest efficiency of reflected light. It is easy to observe that the same source of light in a room with white walls gives several times the intensity of illumination which it gives in a room with black or non-reflecting walls. That means the total amount of illumination is increased several-fold by reflection from white walls. In a draughting room or school room the best efficiency of illumination may be got by using as light walls as possible.

It is not always feasible to have light walls, especially in machine shops or foundries and other places where the walls do not remain white but change to some darker color. The color of almost everything which is changed by age is due to either iron or carbon. In most cases of discoloration by age the reddish-brown color of iron and the brownish-yellow color of carbon are seen. This is the color most objects gradually assume. This color of age is the long wave or low frequency end of the spectrum.

To get the benefit of reflected light from walls which cannot be kept perfectly white, a source of light rich in the long, low frequency waves, or of a yellowish tinge is therefore more efficient, as it gives more reflection from the walls than a source of light rich in short or high frequency waves such as bluish-white. This effect is very marked when the mercury arc lamp is compared with the flame carbon lamp. The illumination given by the mercury arc lamp in a draughting room is very satisfactory, but the same illumination in a foundry or machine shop is far less satisfactory, because of the marked absence of reflected light. Even the black, begrimed walls of a blacksmith shop reflect a considerable amount of light with an orange-yellow source of light, but reflect practically none of the bluish-green light of the mercury lamp.

Thus the shade of color of the illuminant may be very essential in getting efficient illumination. In the interior of a city the walls usually have a reddish-yellow color. In that case white or yellowish lights are superior. Outside of the city the greenish-yellow light of the Welsbach lamp and the bluish-green of the mercury arc, give much larger amounts of reflected light from vegetation than do the yellow of the incandescent lamp and a better illumination results. Vegetation absorbs the long waves, the low frequency radiation, so that with a yellow source of light there is practically no reflection from living vegetation. On the other hand, there is reflection of the long waves from dead vegetation, and in the light of the incandescent lamp or the flame arc all vegetation appears very poorly, because the dead parts are brought out prominently. The reverse is the case where light is deficient in the red and yellow and rich in the green and blue; the green shows prominently, but the dead leaves are not visible.

It is, however, not the amount of light which reaches the illuminated objects, that is to say, the physical intensity of illumination, which is of importance, but the amount of light from these illuminated objects which reaches the eye. With a given intensity of illumination, the amount of light entering the eye will vary widely with the opening or contraction of the pupil of the eye, the eye automatically adjusting itself to intensity of the light. This is the reason one sees well in sunlight and in the light of the full moon, although the former is many thousand times more intense than the latter. The eye can accommodate itself to intensities varying over an enormous range. It does this partly by fatigue of the nerves of vision and partly by the contraction or opening of the pupil. This is undoubtedly a protective device. It follows that if there is in the field of vision a source of high intrinsic brilliancy, the eye protects itself by contracting the pupil and thus receives much less light than it would if the source of light were taken out of the field. By eliminating the source of light from the field of vision and thereby eliminating the contraction of the pupils resulting from the high intrinsic brilliancy of the illuminating body, a larger amount of light is actually sent into the eye, although only the same amount of light strikes the illuminated object; that is to say, a higher physiological efficiency is obtained. Even though a much less amount of light reaches the illuminated objects, more light may reach the eye. That means that the intrinsic brilliancy of the illuminant may be reduced by indirect lighting or by diffusing the light, and thus a considerable amount of light may be lost, yet a larger amount of light enters the eye.

It follows from this that in efficient illumination it is of the greatest importance to arrange the illuminant so as not to have excessive an intrinsic brilliancy in the field of vision. The proper place for the illuminant is outside of the field of vision. Where it can not be so put, its intrinsic brilliancy should be reduced by diffusion. This is the reason for indirect lighting. Even though a large amount of light is thrown on any object in a room, if the eye be fatigued by seeing the source of light, very little light will enter it.

It appears, however, that this automatic protective faculty of the eye was developed through the ages as a protection, not against light, but against energy; apparently the eye is protecting itself against the energy of the radiation, and not against the physiological effect, and since the energy of radiation is mainly in the ultra-red, in the long waves, the frequencies which cause the protective reaction are those of the long wave end of the spectrum, the red and yellow; they make the pupil contract. This action is much less for the green and blue rays, which is the reason the eye does not react to the mercury lamp to any great extent. Therefore a green light, such as is given by the mercury or Welsbach lamp, may be placed more freely in the field of vision without causing the contraction of the pupil and thus reducing the physiological effect. This is of importance in places where the light cannot be well taken out of the field of vision, such as in street illumination. Here all the sources of light must be arranged along the street and so must be in the field of vision. By cutting off the red end of the spectrum the contraction of the pupil may be eliminated and the full benefit of the illumination between the lamps be obtained. It is otherwise with a yellow source of light, such as the incandescent or arc lamp. The physiological effect of the lighting by a green illuminant is, in such cases, superior to that by a yellow illuminant; the illumination appears brighter and more uniform.

A light devoid of red and yellow rays is at the same time the safest and the most harmful. It is the safest and gives the most uniform illumination, if its intrinsic brilliancy is sufficiently low to be below the danger limit of energy of radiation; but is harmful if above that, because the eye does not protect itself against it, probably because these lights have not existed throughout all the ages during which this protective action was being developed, when sunlight and fire were the only sources of light, both of which are rich in red rays. This accounts for the rather contradictory effect observed, that green or blue light, such as given by the Welsbach mantle or the mercury lamp, is a very good light to work by, superior even to the yellow kerosene lamp; and at the same time there is suspicion that it may be harmful to the eye. It may well be that when it is of very high intensity, the automatic action of the eye is not sufficient to protect it against such light. Where such sources of light are used, the benefit of the absence of the contraction of the pupil may be obtained, but the illumination must be arranged so as not to get the harmful effects against which the automatic protection of the eye fails. All of these blue and green lamps are superior for illumination if they have intrinsic brilliancies, but are somewhat questionable if they have extremely high intensities.

It is, however, not even the actual amount of light which enters the eye which is of importance in illumination, but the differences in this light. If in the illuminated area the light is of uniform intensity, and everything of the same color, nothing but a glare of light will be seen. Seeing takes place by the recognition of differences in color and in intensity. Difference in intensity includes shadows. Shadows are thus an essentinal feature in seeing things.

Considering, then, the seeing by shadows and seeing by color differences, illumination may be divided into directed and diffused illumination. In diffused illumination light comes in all directions with approximate uniformity, and shadows do not exist; in directed illumination, shadows exist. In some cases shadows are objectionable. In others shadows are necessary for clear distinction, and diffused illumination in such cases would not be satisfactory.

Where definite color distinctions are required, the sharpness of vision may be intensified by selecting that color of light best suited to bringing out the colors desired. Where the color conditions to be distinguished are those of age, due to iron and carbon, then that light which is deficient in red and yellow, and which therefore shows the colors given by iron and carbon as black, gives a much sharper distinction. The light of the mercury lamp makes blemishes and dirt much more pronounced than a white light. Again, the sources of light which are rich in red and yellow rays emphasize the colors due to iron and carbon less, and make less noticeable blemishes of a slight amount of dirt. Where the color distinctions are those due to these two most prominent elements, their appearance will be greatly softened in the yellow light. Under the green light they will be made harsh and sharp. If it is desired to soften effects, as in a ballroom, it would be fiendish to use mercury lamps, but where the object is to search out a spot that is soiled, it is wrong to use a dull yellow incandescent lamp or gas flame. Rather use the green Welsbach light, or better still the bluish green mercury arc, which gives sharp distinction where white light shows little and yellow light nothing. Where it is desirable to see all colors in about the same relation as by daylight, obviously a white light is necessary.

It is, therefore, important for the illuminating engineer, in selecting the shade or color of the light, to study the requirements of each case which comes into his charge. It would be just as wrong in one case to use an incandescent lamp, if the mercury lamp would be better, as to do the reverse.

It is necessary, therefore, to distinguish between general illumination and local illumination, between direct illumination and indirect illunation, and between directed illumination and diffused illumination. These three different classes or distinctions to a certain extent overlap. It would be wrong to mistake them, and a serious mistake in the design of a system of illumination can thus easily be made. For instance, general illumination and and diffused illumination may be confused. The problem may be to get uniform intensity throughout a room. This may be done by distributing a large number of small units around the cornices and reflect the light from white walls and ceilings,

thus getting a very diffused illumination. Or a general illumination may be obtained with the intensity of illumination everywhere the same in a moderate sized room, from one source of light, by using one source of light such as an incandescent lamp with a reflector which gives a uniform distribution. The former arrangement gives diffused light, the latter directed light. The intensity of illumination may be the same all over the room in both cases, but in the former case there are no shadows, and in the latter absolutely black shadows. Probably for domestic use lighting by the former method would be unsatisfactory and trying to the eyes, because, due to the lack of shadows, objects are not distinct. In the latter case, with directed lighting from one source, the lighting will be unsatisfactory because of the very dark shadows in which nothing can be distinguished. The eyes are tired by trying to see in the shadows.

It is necessary to consider how much directed light and how much diffused light are required. In some cases only diffused light may be desired. In the general lighting of a draughting room directed light is not wanted, since there must be no shadows, because if the ruler casts a shadow, it is trying to the eyes to distinguish between the edge of the ruler and the edge of the shadow, and mistakes may be made. In this case one sees only by differences in color and in intensity, and not by shadows. A satisfactory illumination is given by many small units or by indirect lighting by reflection from white walls and ceilings. An unsatisfactory illumination is obtained from a few units even when properly distributed to give uniform intensity all over, but giving little reflected light. In other cases a general illumination everywhere equal in intensity may be required, but directed illumination may be needed so as to see by the shadows. A good draughting room illumination would not be suitable for a foundry, where all the objects assume more or less the same color. Here shadows are necessary. What is needed is a number of units of light to get directed illumination. But this must not go so far as to make it impossible to see in the shadows. There must be some diffusion or overlapping of the different beams of light. A satisfactory foundry illumination placed in the draughting room, even if the intensity were sufficient, would be entirely unsatisfactory, and so would be the reverse. It is, therefore, not merely the distribution of the intensity of the light, which is essential, but also the character. whether diffused or directed light, or how divided between diffused and directed light.

In different lighting problems these questions of concentrated and general illumination, of directed and diffused illumination, are met. In domestic lighting a high intensity may be obtained by refleeted light from white walls and ceilings. The illumination may be increased several fold over that given directly by the source of light, yet the illumination may be unsatisfactory and tiring to the eyes. In the home a room with white walls is not as agreeable as one with darker walls. There seems to be too much light. But there is not too much light, because there is not anywhere near the same amount of light as there is during the daytime out of doors. There is too large a percentage of diffused light. The intensity of the diffused light is too great as compared with the directed light. The shadows are lost and that is tiring to the eyes.

The problem of domestic lighting is to get sufficient directed and sufficiently low diffused lighting so as to give the best vision. That is, to get sufficient shadows to see by. But the shadows must not be so dark as to make seeing objects in the shadows themselves tiring to the eyes.

During the daytime there is directed light from the windows and diffused light reflected from the walls. To get the proper proportion between directed and diffused light is what fixes the shade of the walls, and in general it is necessary to have the walls of somewhat darker color. But when lighting in the evening with a source of light like the incandescent lamp or the gas lamp, which sends out light in all directions, the diffused light as compared with the concentrated or directed light is greater than in the daytime for the colored walls, due partly to the color of the light, which is yellow and reflected more, but largely because the directed light coming through the window forms a much larger percentage of the total light than that of the lamp, where only a small part is concentrated light. It is not comfortable to have this strong diffused light, and therefore the walls are shaded so as to absorb three-quarters of the light. That means waste, however, and the light which is not used must be paid for. Proper illuminating engineering then is to secure the correct distribution of light so as to give the desired amount of concentrated lighting on the dining or reading table, and to give only as much diffused lighting as is compatible with the amount of direct light used. The problem of domestic lighting, from the illuminating engineering point, is to determine the proper illumination over the entire area, and also the character of illumination, whether directed or diffused, and how much of the light should be concentrated, and how much should be directed. Another important feature is the question of colors and shades as was discussed before.

Practically nothing has yet been done in this direction systematically and iutelligently. Problems are solved by trial, which usually means producing more light than is necessary, and throwing away the excess of the diffused light by absorption.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Evansville (Ind.) Gas and Electric Light Company will extend its main system to and through the streets of Oakdale.

MR. RICHARD FISCHER, State Chemist of Wisconsin, has issued the following letter of instruction to the authorities and to the gas companies under the quasi-control of such authorities:

"You are hereby notified that the undersigned having been designated State Chemist, by the Hon. J. Q. Emery, State Dairy and Food Commissioner, has determined and made in conformity to Section 5, Chapter 459 of the Laws of 1905, standards of heating value and evenness of pressure of all gas for the State of Wisconsin as follows:

"*Standard of Heating Value.*—One cubic foot of gas measured at 60° F., and under a barometric pressure of 30 inches of mercury when saturated with water vapor, shall have a net heating value of not less than 600 British thermal units as measured by means of a standard Junkers' gas calorimeter.

"*Standard of Evenness of Pressure.*—The pressure of the gas at any point 14 feet above street level shall not be less than that required to support a column of 2 inches of water at 60° F., nor more than that required to support a column of 3½ inches of water at 60° F., Wisconsin." Dated at Madison, Wis., this 4th day of March, 1907.—RICHARD FISCHER.

MESSRS. BARTLETT, HAYWARD & Co., of Baltimore, are under contract to construct a holder for the Hagerstown (Md.) Gas Light Company, the vessel to have a retaining capacity of 300,000 cubic feet.

MR. M. J. LEYDEN has been appointed Superintendent of works for the Queens Borough Gas and Electric Company, with headquarters at Far Rockaway, L. I.

HERE is another instance of the caliber and nature of Col Ira C. Copley, who is certainly a credit to the gas industry and to the great State of Illinois as well. The Aurora (Ills.) Chamber of Commerce, since its organization something over a year ago, has naturally been doing all in its power to foster and promote the interests of that city. Amongst the matters brought forward on such behalf was the raising of a fund to induce manufacturers to locate there. When the fund raisers approached the Colonel on the subject his reply was: "Speaking for the Western United Gas Company, we will give to the fund one-fifth of the total amount that may be subscribed. For instance, if $100,000 be secured we will add thereto $20,000; if $200,000, we will pay in $40,000. And we will pay in proportion for any sum raised between the particularized amounts."

MR. R. E. BRUD, JR., formerly of Marion, Ind., has been elected Vice-President of the Gas and Electric Company, of America, with headquarters in its home office, which are in the Witherspoon Building, Philadelphia.

WORK on the proposed gas plant for Three Rivers, Mich., will be commenced forthwith. Mr. M. O. Straight, of the Ambrose Petrie Company, is to manage the enterprise.

THE plant at Pana, Ills., will be constructed this spring. The projectors are expecting to expend $75,000 thereon.

THE Pend d'Oreille Iron Works has about determined to build and operate a gas works at Sandpoint, Idaho.

THE taxpayers of Great Falls, Mont., will vote next month on the proposition for the issuance of a franchise for the construction and operation of a gas works for the named place.

THE Gas Machinery Company, of Cleveland, O., has been awarded a contract for the construction of an 11-foot set of water gas apparatus in the generating plant of the Detroit City (Mich.) Gas Company.

THE Humphrey Company, of Kalamazoo, Mich., has issued a very handsome, illustrated pamphlet, descriptive of its specialties in the heating of water for the household. The warm title of the pamphlet is "Humphrey Keeps You in Hot Water;" and that is at once apparent and real.

WRITE to the Green Fuel Economizer Company, of Matteawan, N.Y., for a copy of its pamphlet narrating "How to Save 15 Per Cent. of the Coal in Making Water Gas."

THE dedication exercises in connection with the formal opening of the Engineering Societies building in this city have been set for April 16th. Mr. T. A. Martin, Chairman of the Institute Committee, has arranged a programme for the exercises that is most thorough, and in

some manner illustrates the vast amount of work planned and successfully executed by him and his associates in this huge undertaking.

AMONGST the many interesting things that went in the February issue of "Gas News" is an illustrated description of a table in the shops of the Empire Mirror Company, 511–513 Paterson avenue, West Hoboken, N. J., on which mirrors of all sizes and shapes are laid for treating or repairing. Of course, gas is the fuel used in the process.

"THE annual meeting of the shareholders in the Nashville (Tenn.) Gas Company was held according to notification. The President, Mr. Whitefoord R. Cole, presented his annual report, which business like document told of the Company's progress in the twelvemonth. The President congratulated his associates on the strides taken by the concern, and noted that the demands upon its generating resources had become so pressing that the only way to meet the same was in the construction of a modern plant fully up to the gaseous needs of Greater Nashville for at least a decade. There can be no doubt about it that Mr. Cole was the right man in the right place, which suggestion will be shortly proved in the added returns on their investment which will accrue when the reforms that Mr. Cole has instituted are in successful operation. This is the new Board of Directors put forth, Mr. Cole declining re-election: A. H. Robinson, J. B. Richardson, Thos. H. Mason, Jr., Joseph H. Thompson, D. S. Williams, B. F. Wilson and T. J. O'Keefe.—F. Y. R."

THE Coos Bay Gas and Electric Company, the headquarters of which are in Tacoma, Wash., is constructing a gas plant in Marshfield, Ore.

THE financial management of the Consumers Gas Company, of Toronto, Ont., recently gave notice that the Company will sell 6,000 shares (par value $300,000) of new stock at public auction June 6th.

AT the annual meeting of the Syracuse (N. Y.) Gas Company the officers elected were: Directors, George A. Wood, Jerome L. Cheney, John J. Cummins, F. J. Lynch and F. J. Baker; President, G. A. Wood; Vice-President, J. L. Cheney; Treasurer and General Manager, John J. Cummins; Secretary, F. J. Baker.

THE gas rate at Duluth, Minn., has been reduced to 75 cents per 1,000 cubic feet. According to the returns the cost of the gas plant (it is operated on municipal account) figures $615,632. The output for the twelvemonth was 151,000,000 cubic feet.

MR. JOHN P. KENNEDY, who succeeds the late Mr. Horace A. Allyn as Superintendent of the Cambridge (Mass.) Gas Light Company, is a graduate of Stevens Institute, Class of 1896, and has been in the service of the firm of Humphreys & Glasgow since 1890. Mr. Albert M. Barnes, Treasurer of the Company for some years, has been appointed its General Manager also.

THE Stacey Manufacturing Company, of Cincinnati, O., has been awarded the contract for the construction of a gasholder for the Anderson (Ind.) station of the Union Gas Light Company, rated to retain 550,000 cubic feet. It will rest in a steel tank, and it is to be of the 3-lift order. This holder is to be located in a district in which natural gas only is supplied.

MR. JACOB RADER, one of the organizers of the Easton (Pa.) Gas Company, died at his home in Easton, the morning of the 3d inst. Deceased was in his 86th year, having been born March 20th, 1821, in a then suburb of Easton west of Bushkill Park.

MR. JABEZ K. MONTGOMERY, at one time President of the Chelsea (Mass.) Gas Light Company, died at the Frost Hospital in that city, the evening of March 7th. He was one of the pioneer shipbuilders of that district of Boston, was prominently identified with the financial institutions of old Chelsea, and was Chairman of its Park Commission for several years.

AT a recent meeting of the shareholders in the Corona (Cal.) Gas and Electric Company, Mr. E. A. McGilvray was elected President, and Mr. Earl McDonald was appointed Manager.

ABOUT a fortnight ago 8 gas consumers in Cleveland, O., appealed to the City Chemist (Mr. Wm. Pate, Jr.) to have their meters tested. This was the result: 1 meter registered 4 per cent. fast; the others were slow, ranging from 3 per cent. to 9 per cent. The average error was 5.2 per cent. slow.

MESSRS. SARGENT & LUNDY, of Chicago, have been retained by the Union Gas and Electric Company, of Cincinnati, to design the buildings for the Company's new station, to be located on the river front at a point bisected by Tennyson street. The ground space is 1,100 feet by 375 feet, and the scope of the station will be up to full electrical needs of the Company. In the equipment one item calls for the placing of 8 steam turbine electric generators, each of 666-horse power. The estimated cost of the station complete is returned at $2,000,000.

THE appeal of the Syracuse Lighting Company from the order of the Commission of Gas and Electricity of New York, ordering a rearranging of the Company's gas and electric lighting sales' schedule, has been discontinued without costs.

THE City Council of Newark, N. J., has instructed the City's Attorney (Mr. James R. Nugent) to draw a bill for presentation to the Legislature which bill will abolish the city department of inspection of gas and gas meters. Elsworth Francisco now holds the position of inspector.

A BILL is under consideration by the Minnesota Legislature which provides that any city of that State may issue bonds for the purpose of purchasing any of the existing gas, water or trolley systems.

COLONEL FRANK S. RICHARDSON has again put himself in the limelight. This time he spoke (and an excellent speech it was) before the Young's Men's Christian Association, of Springfield, Mass., on "Gas and Gas Manufacture." His tenses were illuminative, his moods were indicative of his knowledge of the subject, and his auditors were synthetically appreciative.

THE Central Maine Gas and Supply Company, of Skowhegan, Me., has been incorporated by Messrs. W. R. Conner, R. A. Wentworth and Forrest Goodwin, to supply gas and electricity. It is capitalized in $250,000.

THE bids for the rehabilitation of the Richmond (Va.) City gas works have been tabulated by the Councilmanic Committee on Light, but it is thought that no awards will be made prior to the 10th prox.

THE assessment laid on the properties of the Twin State Gas and Electric Company, of Brattlebro, Vt., for purposes of State taxation was originally put at $65,000. An appeal from that rating was so well put that the assessment on review was fixed at $50,000.

MANAGER CREIGHTON, of the Lansing (Mich.) Fuel and Gas Company, has leased the store adjoining the Company's present business headquarters, and will fit the same up in a fashion corresponding to the handsome finish of the existing offices and showrooms. Mr. Creighton is always "on the job."

THE Gas Bench Construction Company, of St. Louts, Mo., has the following contracts on its books: Two benches at De Kalb, Ills., and Watertown, Wis.; single benches at Washington C. H., O., and Coldwater, Mich., and 30 refillings for Cincinnati and two refillings at Belleville, Ills.

AN extension of the time named, in which the Electric Light and Power Company's franchise for the construction of a gas plant in Elizabeth City, N. C., has been granted by the Board of Aldermen.

ABOUT a fortnight ago the appeal of the Consolidated Gas Company, of New York, to upset a judgment in favor of G. S. Pollitz, was approved by the Appellate Division of the Supreme Court. It was decided, all the justices concurring, that the Company could not be forced to furnish gas at 80 cents per 1,000 cubic feet to a consumer who refused to pay a deposit. See 66 of the Transportation corporation law, it was pointed out, provided that a gas company might require every person to whom it supplied gas to deposit a reasonable sum as security for the payment of bills for gas supplied. The plaintiff in the suit for an injunction refused to make this deposit, whereupon his gas was turned off by the Company. "There is nothing," said Justice Clarke, in writing the decision, "in Chapter 185 of the laws of 1906, fixing the price of gas, which in any way repeals, modifies, or affects the sections of the Transportation Corporation law hereinbefore cited. Therefore, the defendant [Consolidated Gas Company], by reason of the plaintiff's refusal to make the deposit required, has an absolute right, under the statute, to cut off the gas."

MR. JOSEPH M. BERKLEY has been appointed Chief Engineer to the City Gas Company, of Los Angeles, Cal., which is projected and backed by a number of the most prominent capitalists of that city. It is proposed to construct there this summer a plant up to a daily output of 3 million cubic feet.

COLONEL E. G. PRATT is now permanently in Chicago as to his business enterprises. As told by us some time ago, the Colonel may be engaged on all matters connected with the industry in an advisory and consulting capacity.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MARCH 25, 1907.

The Market for Gas Securities.

Whatever trading was done in Consolidated in the week was made at higher figures than those ruling the week previous; but the shares are still at ridiculously low figures. The opening to-day (Friday) was 120 to 120¼ as against 114¼ to 115 last Friday. If ever there was a bargain on the counters of the Exchange it is Consolidated. Brooklyn Union remains away below its worth, the nominal being 108 to 116.

Peoples, of Chicago, stiffened up quite a bit, but at 89 to 89¼ it bears all the earmarks of limpness. Watch it stiffen. Massachusetts Gas Companies looks tempting at 59¼ to 60. The report of the Boston Consolidated Gas Company showed a gain of 13.45 per cent. in February over the corresponding month of last year. Pretty good going. The Cincinnati Gas and Electric Company has declared a dividend of 1¼ per cent.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 25.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	120	120¼
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000 000	1,000	98¼	100
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	108	116
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	999,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000.000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	20,500,000	100	97½	98
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,300,000	50	200	204
Consolidated, Baltimore	11,000,000	100	.	90
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
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Consolidated Gas Co. of N.J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,615,000	1,000	..	98
Detroit Gas Co., 5's	351,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds.	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,006	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	59½	60
Preferred	25,000,000	100	82½	83
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	89	89¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105½
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¾	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047.000	1,000	102	..
Washington, D. C	2,600,000	20	292½	300
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600.000	50	230	

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., Mar. 13, 1907.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1907, to stockholders of record at the close of business, Mar. 30, 1907. Checks will be mailed.

1658-4 LEWIS LILLIE, Treasurer.

To Gas Works Constructors.

The authorities of Charlottesville, Va., are ready to receive bids for the rehabilitation of the Charlottesville gas plant. Address all communications in this matter to

H. M. HANTZMON, Supt.,

1659-2 402 PARK ST., CHARLOTTESVILLE, VA.

Estimates furnished for the erection of complete gas works or the extension and modernizing of old works. All work warranted. Both water gas and coal gas.

EMPIRE GAS IMPROVEMENT & CONSTRUCTION COMPANY,

1628-tf 49 Wall Street, New York.

Position Wanted

As Manager or Superintendent of a Gas Company,

By a young man who has had 10 years of practical experience in the manufacture and distribution of coal and water gas. Also good accountant. Best of references furnished. Address, "BOX 133,"

1658-2 Care this Journal.

Position Wanted

By a Practical, All Round Gas Man, as Superintendent of a Coal or Water Gas Plant

Having a daily capacity of from 100,000 to 1,000,000 cubic feet. First class references.

1657-4 Address, "E. P. J.," care this Journal.

Position Wanted.

A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.

Address, "P. T. A.,"

1641-tf Care this Journal.

WANTED,

Position as Superintendent of Gas Company,

By young married man of 16 years' experience in all its branches. Is now superintendent of gas company of 30,000,000 cubic feet. Will have to give present company 60 days' notice. Best of references.

1652-tf Address, "CAPABLE," care this Journal.

POSITION WANTED.

Gas Engineering Draughtsman.

First-class man, desires responsible position with gas contractor or gas company who is remodelling or extending plant. Thoroughly conversant with the design, construction, erection and actual working of all kinds of gas apparatus. Large and varied experience. Estimates, specifications, shop practice, surveying, levelling, building construction, coal and coke handling, etc.

Address, "BOX 134,"

1659-1 Care this Journal.

Position Wanted.

Young man, with 11 years' practical experience in the manufacture and distribution of coal and water gas, desires position as superintendent of gas company (Canada preferred). Can give best of references.

Address, "S. W. F.,"

1659-1 Care this Journal.

WANTED,

AN AGENT IN EVERY STATE,

To introduce as a side line to gas companies and others the Ackroyd True Radiator, which does everything other gas heaters fail to do. A quick seller. The only satisfactory heater on the market. Write for particulars.

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1656-4 PLAINFIELD, N. J.

INSTRUCTOR.

An instructor is open for temporary engagements. If your shop is not giving results can instruct your foreman and men in up to date system and run your distribution department on a paying basis.

Address, "INSTRUCTOR,"

1659-1 Care this Journal.

WANTED,

An A-1 Solicitor,

For taking charge of the soliciting department of a gas and electric company in a town of 50,000. State experience and salary wanted.

Address, "B. C. B.,"

1659-2 Care this Journal.

WANTED,

Superintendent and Manager of Gas and Electric Light Plant in New England.

Give experience, age, and salary required, to

1658-2 "G. E.," care this Journal.

WANTED,

A Young Man as Foreman of Coal Gas Plant in a Southern Town of 10,000 Inhabitants.

Must be sober, honest and a hustler, and acquainted with all kinds of gas construction.

1658-2 Address, "SOUTHERN," care this Journal.

WANTED,

RETORT HOUSE FOREMAN,

For gas works putting out 300,000 feet per day. Must be an A-1 man. State experience and salary wanted.

Address, . . "N. I. L.,"

1659-2 Care this Journal.

WANTED,

One 5-Foot Station Meter.

One Small Exhauster. about a No. 3, with engine. Address, CITY LIGHT CO., Incorporated,

1658-4 HOPKINSVILLE, KY.

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Rights for City and Town Gas Plants, or for Territory in the United States and Foreign Countries.

A new, economical and continuous process of manufacturing producer gas, coal gas, water gas. A fixed gas of any reasonable calorific power, suitable for compression, produced at low cost. Any and all fuels used. Apparatus inexpensive. Can be installed in units of any required output of gas. Works equally well on 1 ton coal to 50 tons coal, or equivalent in other fuel, daily. Address, W. H. ADAMS, Patentee,

1657-tf Box 209, Portland, Ore.

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NO EXTRA LABOR OR OPERATING EXPENSES.
IMPROVED AMMONIA CONCENTRATOR.
About 100 in use. Write to
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STEWARD'S EASTERN DEPOT.

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47 Murray Street, New York.
Fensterer & Ruhe, Agents.
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The advertiser is prepared to negotiate with a first-class **Meter Manufacturing Firm,** to take up the manufacture of **a New Rotary Station Meter;** absolutely the **Smallest, Simplest** and **Best** on the market. Can give a **Five-Year Guarantee** with same. Cost of repairs at any future date practically nil. Can be manufactured from the Smallest Size to 600,000 Cubic Feet per Hour or Larger.

As to Efficiency, Etc., Full Particulars Given.

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The 4,000,000 Cubic Foot Per Day

ROTARY STATION METER

FOR THE

CONSOLIDATED GAS COMPANY OF NEW YORK.

Dimensions: Base 84 in.; Face to Face, Flanges 108 in.; Height 99½ in.; Connections 20 in.

The above illustration was made from a photograph taken at the Manchester works of our English company on the day (Aug. 11) this meter was shipped.

This ***Four Million*** foot Rotary Meter is about to be installed at the 21st Street station of the Consolidated Gas Company in the City of New York.

One-half the Cost—One-tenth the Space.

When in Need of Station Meters

write

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NEW YORK OFFICE, - - 56 PINE STREET.

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EXHAUSTERS, CONDENSERS, SCRUBBERS,
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BY PRODUCT MACHINERY,
COMPLETE GAS PLANTS.

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THE GAS MACHINERY CO.
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Parker-Russell Mining and Mfg. Co.,

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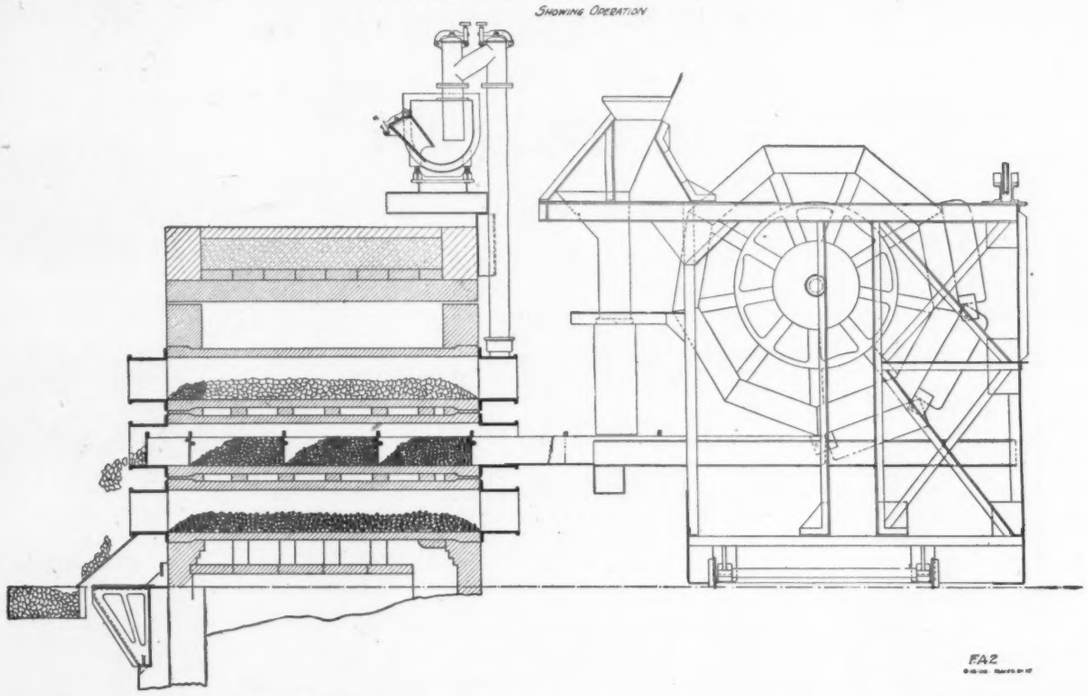
GAS RETORTS AND FIREBRICK.

We Manufacture Gas Retorts and Settings, Furnace Blocks and Fireclay Tiles of every description.

FIDDES-ALDRIDGE SIMULTANEOUS RETORT DISCHARGING-CHARGER SHOWING OPERATION



Benches.--We erect GAS RETORT BENCHES with Horizontal retorts having closed ends up to 10 feet in length, or Through retorts up to 20 feet in length.

Slopers.--Also, SLOPERS on improved lines for Inclined Retorts.

Stoking Machinery.--Sole Agents for U. S. and Canada for the Fiddes-Aldridge Simultaneous Discharging Charger. The "F. A.," or "One-Stroke" Machine. Cost of Carbonizing reduced to minimum. No Dust. Silent. No Waste of Coal. No Injury to Retorts.

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CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE, AS OF ST. LOUIS.

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NOTHING SUCCEEDS LIKE SUCCESS.

BRAY BURNERS

Are made by a company that makes **more open flame** burners than **any other concern in the world.**

The makers of the **BRAY only make burners, and, knowing how, they make the best.**

When you buy **BRAY BURNERS** you buy **durability, efficiency** and **satisfaction,** both for **yourself** and your **consumer.**

There is 40 years of experience back of every Bray Burner.

Self-Lighting Burner.

W. M. CRANE COMPANY,

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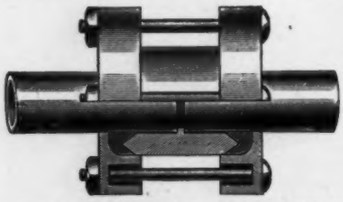
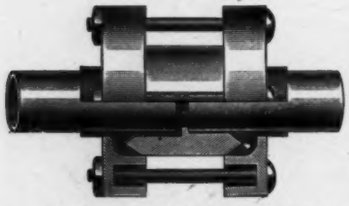
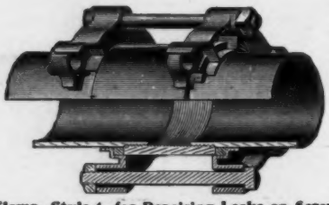
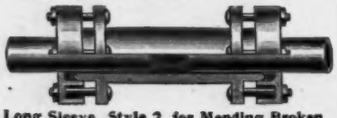
WE MAKE GAS APPLIANCES OF ALL KINDS. Sole Agents for Bray Burners in the U. S. and Canada.


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.


Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe,


Clamp, Style 4, for Repairing Leaks on Screw Collar.


Long Sleeve, Style 2, for Mending Broken Lines.

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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

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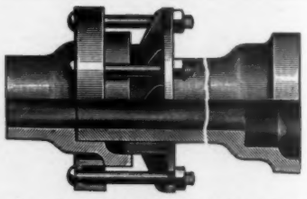
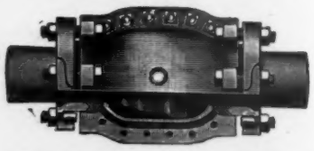
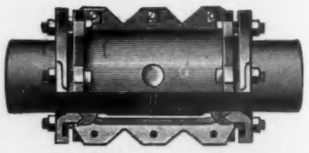
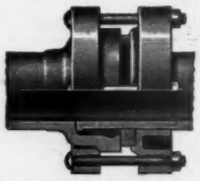

Coupling, Style 9, for Special Style Cast Iron Pipe.


Split Sleeve for Repairing Broken Bell or Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.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It is especially adapted for lighting hotel dining rooms, public halls, well-furnished offices and merchandise display rooms. It gives a greater volume of light and of softer and purer quality than any lamp of any kind manufactured.

Operated with chain-pull or push-button, it is as convenient as electric light. The white porcelain reflector adds greatly to the power of the light, and altogether it is as handsome as it is possible to make a light for the purposes intended.

One placed on exhibition will prove a most valuable advertising feature.

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DESIGN, CONSTRUCT AND OPERATE COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

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AMERICAN TRUST BUILDING,

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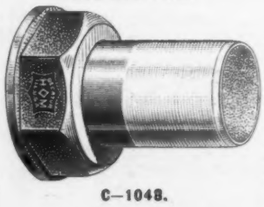

C—1048.

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In using these couplings you do away with any possible chance of having to do your work over because of faulty or defective castings. They are thoroughly tested at the factory and are known beyond doubt to be free from anything that would render them unserviceable.

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FOR IRON PIPE.

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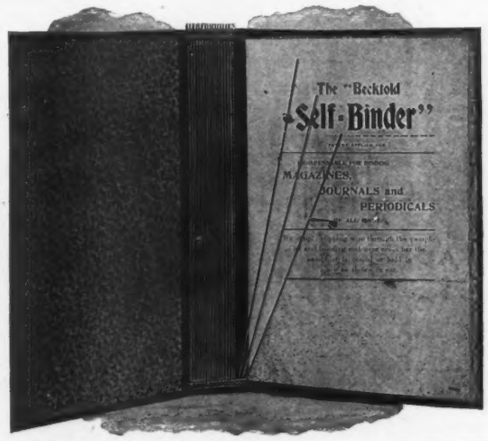

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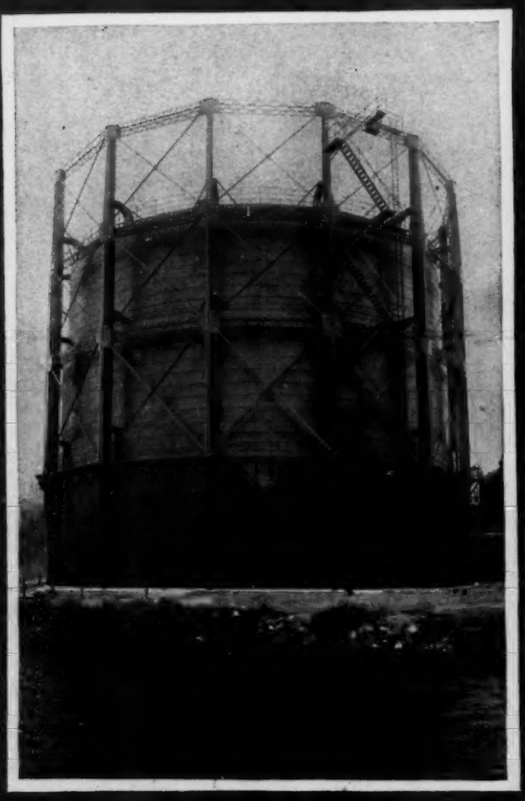

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WITH OR WITHOUT
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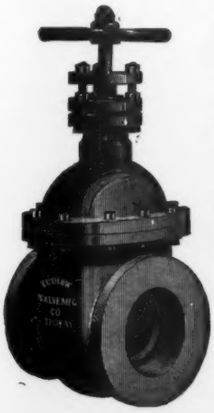

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Double and Single Gate Valves, ¼" to 72",

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High Grade Firebrick, Blocks, Tiles,

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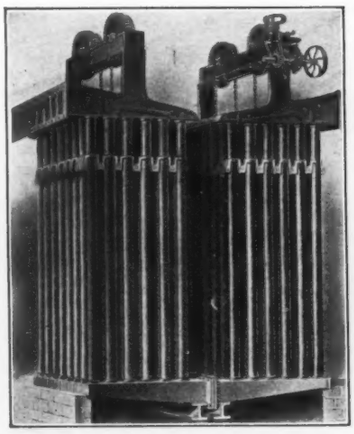

HOW MUCH COAL PER 1,000 CU. FT. OF WATER GAS?

If the process of making water gas were theoretically perfect, only 24 lbs. of coal would be consumed per 1,000 cu. ft. of gas generated. As a matter of fact, the actual figures are between 40 and 48 lbs. per 1,000 cu. ft. It is apparent that there is a waste somewhere, and if you will take the trouble to put a thermometer over the stack valve during the "blowing up" period, you will see where the heat goes to. From one-third to one-half of the heat escapes to the atmosphere, either as sensible heat or latent heat of combustion. If use can be found for this heat a great economy could be effected immediately.

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After the gases have passed through the air heater they are still hot enough to use in a Green Fuel Economizer to heat the boiler-feed water up to the evaporative point. In In this way a quarter of the boiler coal can be saved. In connection with a 6-ft. generator an investment of $3,500 in an Air Heater and an Economizer will save from $2,300 to $2,500 per year. This ought to repay you for the trouble of writing us for further information. Ask for Circular "AG."

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MATTEAWAN, N. Y.

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FOR HOT BATHS,

And for every other Hot Water Need, use the

IMPROVED

HUMPHREY CRESCENT INSTANTANEOUS WATER HEATERS.

Efficient. Compact. Durable. Every Heater Guaranteed.

No. Heaters.	Price.	Gas Supply from Meter.	Heats Gals. per Min. 50° in Temperature.	Height.	Diameter.	Shipping Weight.
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" 8	23.50	½ "	2½	28⅛ "	10¼ "	48 "

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Maximum Efficiency,
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WHY DO GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS BUILT BY

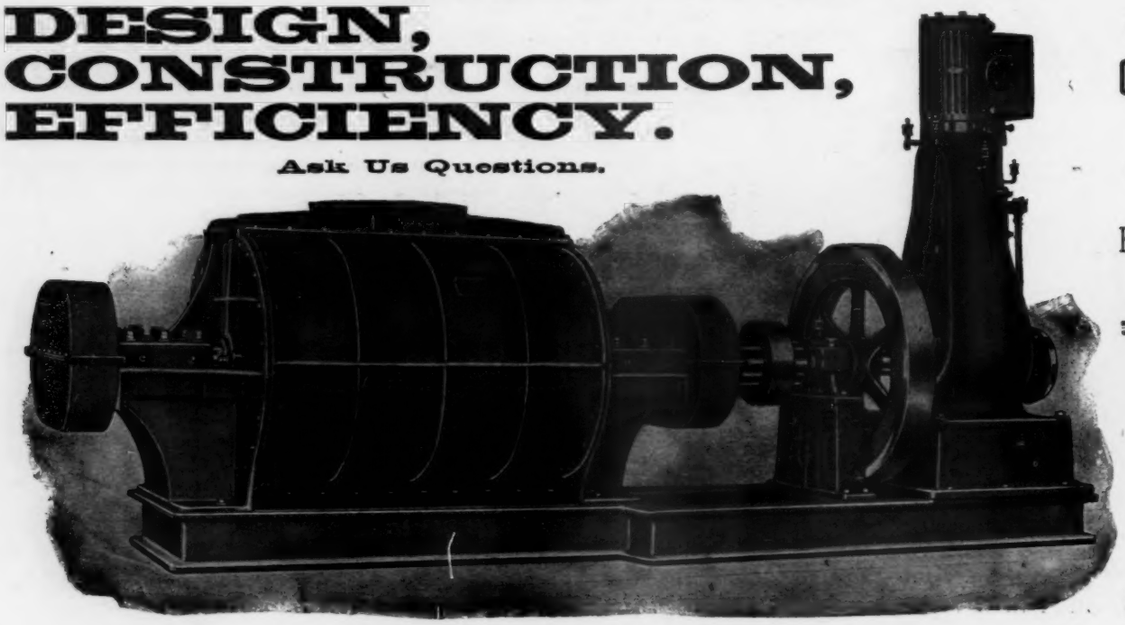
THE CONNERSVILLE BLOWER CO.

Stand so High in the estimation of those using them?

THE ANSWER IS IN THREE WORDS:

DESIGN, CONSTRUCTION, EFFICIENCY.

Ask Us Questions.



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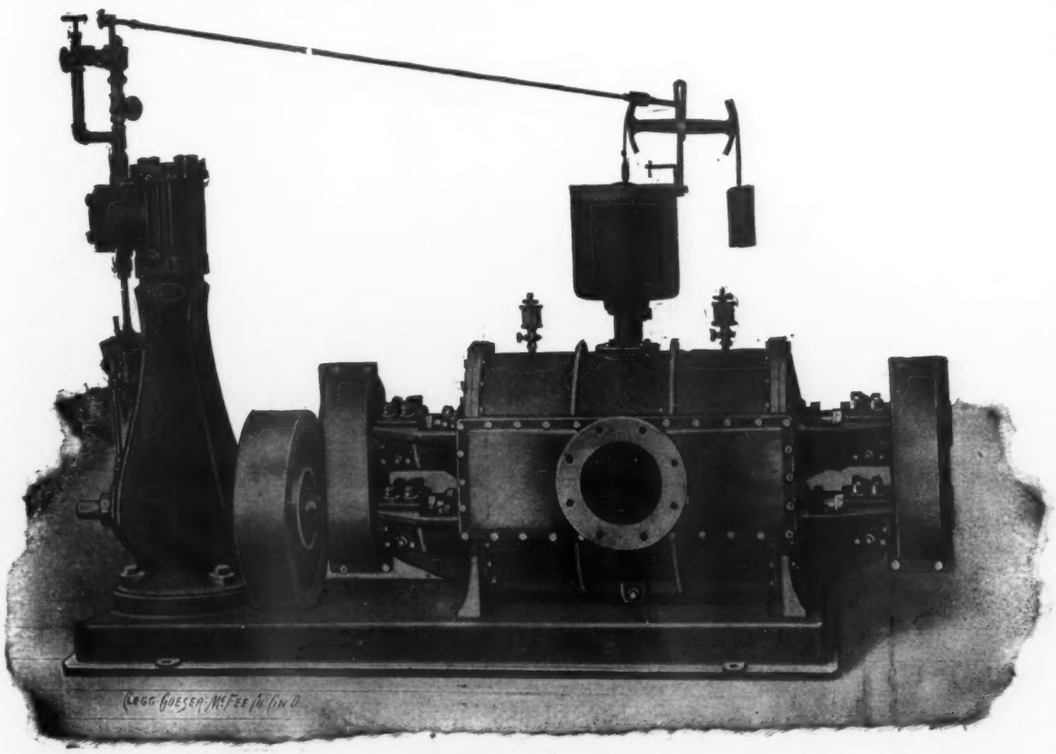
Write us about our Improved Stuffing Boxes.

Something Entirely New.

ROOTS' GAS EXHAUSTERS.



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Most perfect and sensitive Governor.

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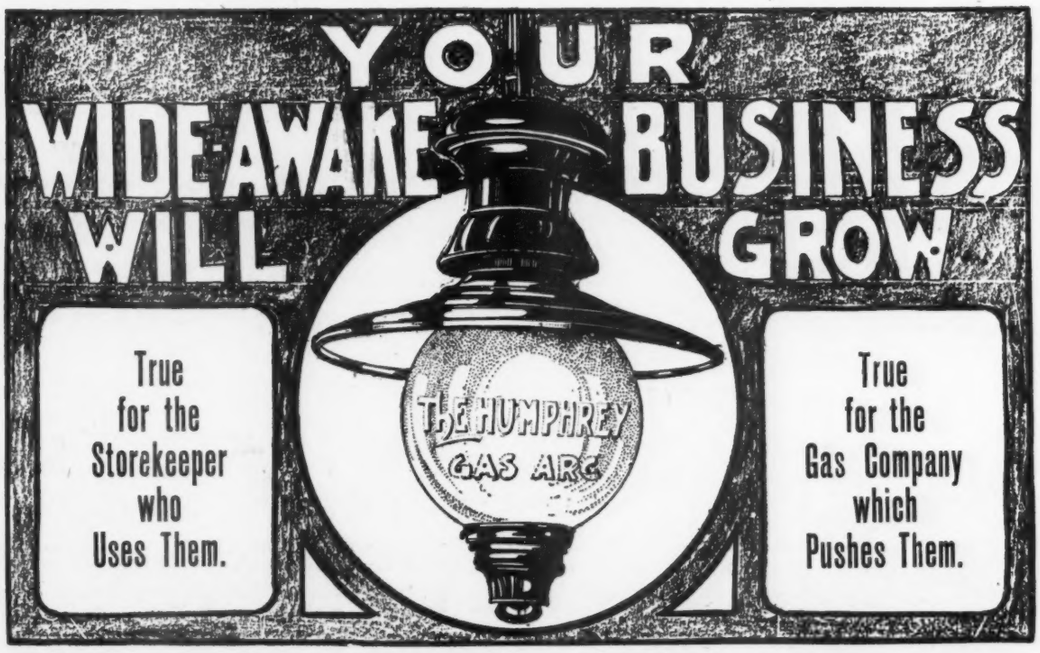

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Also, FLANGE PIPE, LAMP POSTS, Etc.

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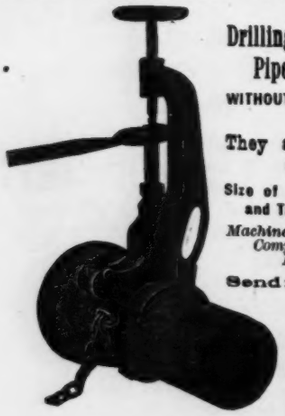

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They are Strong and Compact.

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Machines Sent to any Gas Company for Thirty Days' Trial.

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From Three to Forty-Eight Inches Diameter. Also, all Sizes of

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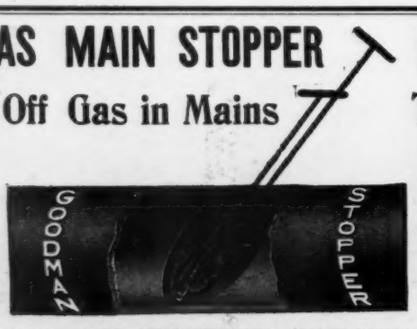
For Shutting Off Gas in Mains Temporarily during alterations and repairs. : : : :

Any size gas main can be shut off in 30 seconds. : : :



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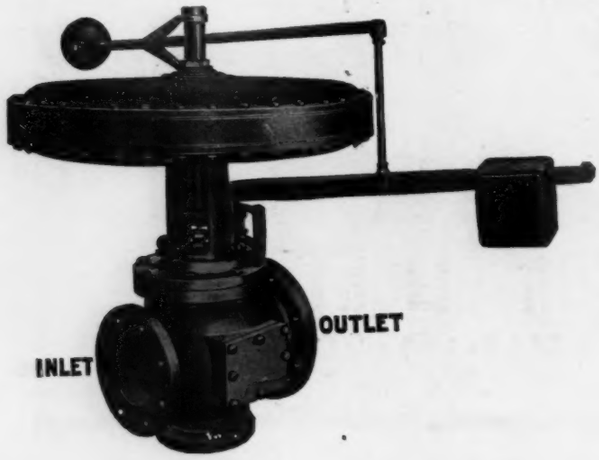

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

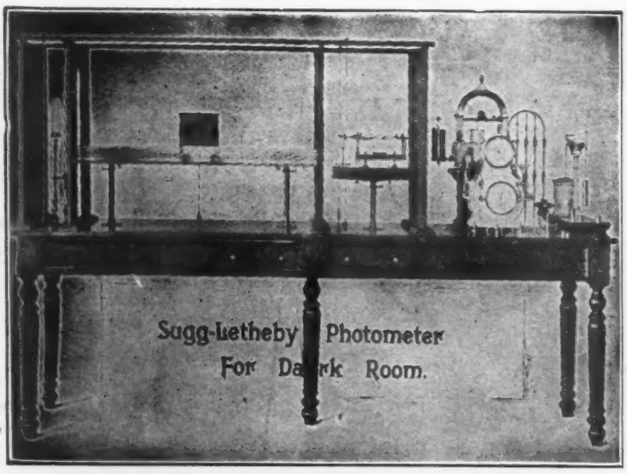
APRIL, 1907.

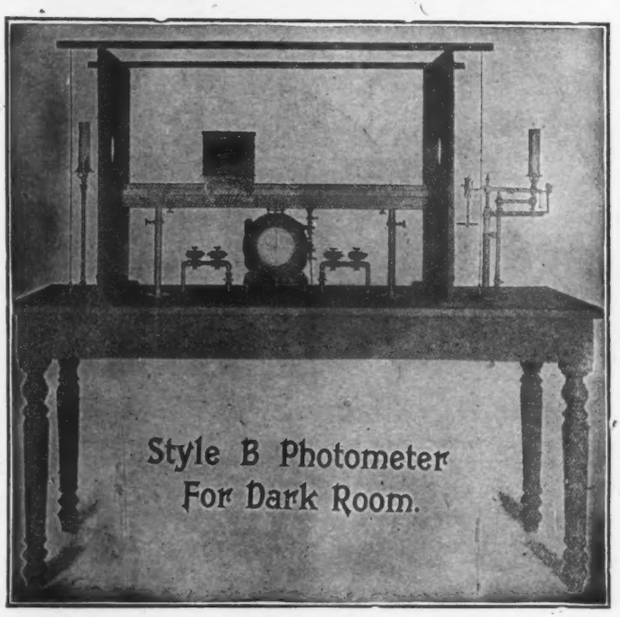
Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.
Mon.	1	6.50 PM	10.50 PM
Tue.	2	6.50	12.00
Wed.	3	6.50	1.00 AM
Thu.	4	6.50	2.10
Fri.	5	6.50 LQ	3.00
Sat.	6	6.50	3.50
Sun	7	7.00	4.30
Mon.	8	7.00	4.30
Tue.	9	7.00	4.30
Wed.	10	7.00	4.30
Thu.	11	7.00	4.30
Fri.	12	7.00 NM	4.30
Sat.	13	7.00	4.30
Sun.	14	7.10	4.20
Mon.	15	7.10	4.20
Tue.	16	7.10	4.20
Wed.	17	10.20	4.20
Thu.	18	11.20	4.20
Fri.	19	12.00	4.20
Sat.	20	12.50 AM FQ	4.20
Sun.	21	1.20	4.10
Mon.	22	2.00	4.10
Tue.	23	2.30	4.10
Wed.	24	3.00	4.10
Thu.	25	3.30	4.10
Fri.	26	No L.	No L.
Sat.	27	No L FM	No L.
Sun.	28	No L.	No L.
Mon.	29	7.20 PM	9.40 PM
Tue.	30	7.20	10.50

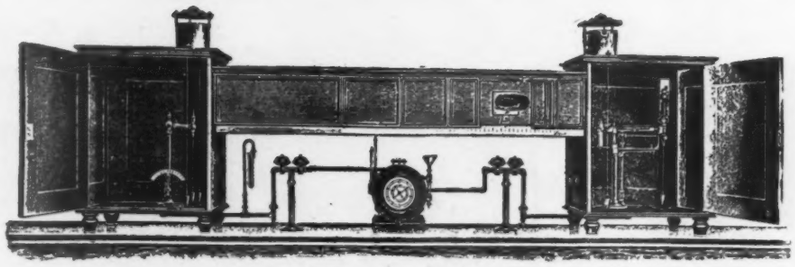
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

APRIL, 1907.

Day of Week.	Table No. 2. NEW YORK CITY. All Night Lighting. Date.	Light.	Extinguish.
		P. M.	A.M.
Mon.	1	6.10	4.55
Tue.	2	6.15	4.40
Wed.	3	6.15	4.40
Thu.	4	6.15	4.40
Fri.	5	6.15	4.40
Sat.	6	6.15	4.40
Sun.	7	6.15	4.40
Mon.	8	6.15	4.40
Tue.	9	6.25	4.30
Wed.	10	6.25	4.30
Thu.	11	6.25	4.30
Fri.	12	6.25	4.30
Sat.	13	6.25	4.30
Sun.	14	6.25	4.30
Mon.	15	6.25	4.30
Tue.	16	6.30	4.20
Wed.	17	6.30	4.20
Thu.	18	6.30	4.20
Fri.	19	6.30	4.20
Sat.	20	6.30	4.20
Sun.	21	6.30	4.20
Mon.	22	6.30	4.20
Tue.	23	6.40	4.10
Wed.	24	6.40	4.10
Thu.	25	6.40	4.10
Fri.	26	6.40	4.10
Sat.	27	6.40	4.10
Sun.	28	6.40	4.10
Mon.	29	6.40	4.10
Tue.	30	6.45	4.00

TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Bread and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

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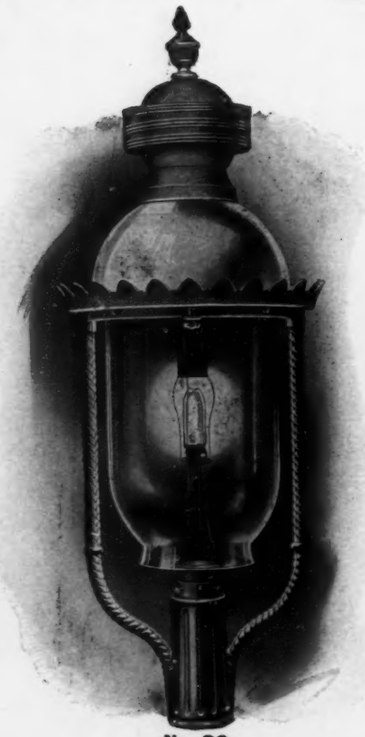
....OF AMERICA....



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Seattle, Wash. (2d contract).
Philadelphia, Pa.
Waterbury, Conn.
Manchester, N. H.
Allentown, Pa.
Omaha, Neb.
Muskegon, Mich.
Nazareth, Pa. (2d contract).
Lewistown, Pa.
Greenville, Tex.
New York, Cent. Un. (3d contract).
Jefferson City, Mo.
Peekskill, N. Y. (2d contract).
Waterville, Me.
Washington, D. C. (4th contract).
Lawrence, Mass. (3d contract).
Hampton, Va.
Aurora, Ills. (2d contract).
Milwaukee, Wis.
Syracuse, N. Y. (2d contract).
Davenport, Ia.
S. Brooklyn, N. Y. (3d contract).
Delray, Mich.
Albert Lea, Minn. (2d contract).
Leominster, Mass. (2d contract).
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TOTAL SETS INSTALLED IN 1906, ... 41
TOTAL SETS TO DATE, ... 634
TOTAL DAILY CAPACITY, ... 502,555,000 cu. ft.

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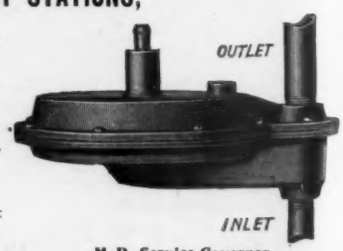

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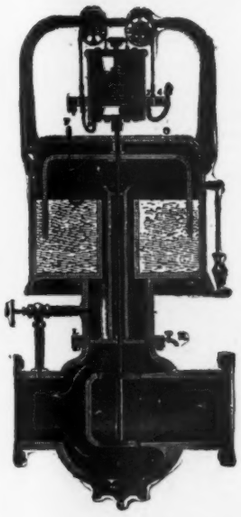

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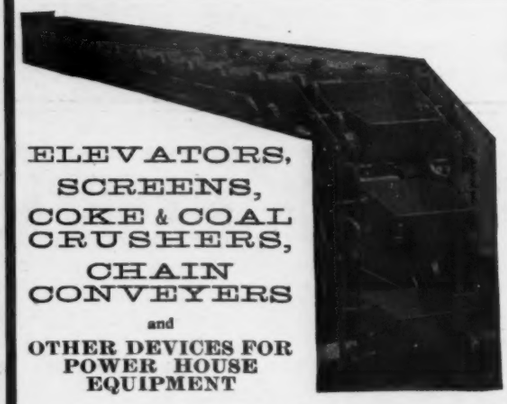

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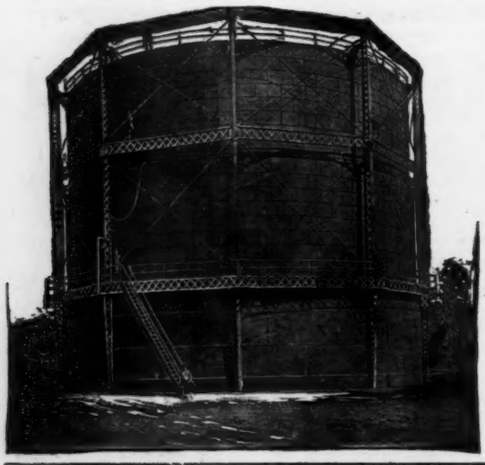

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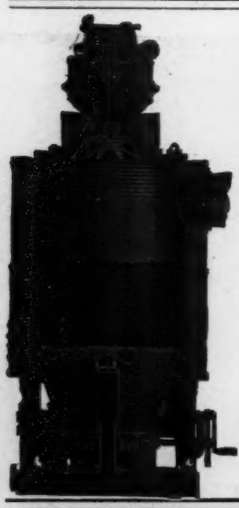

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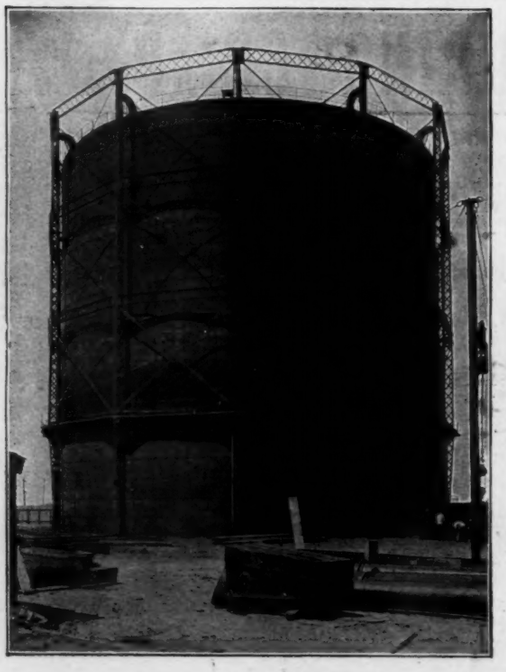

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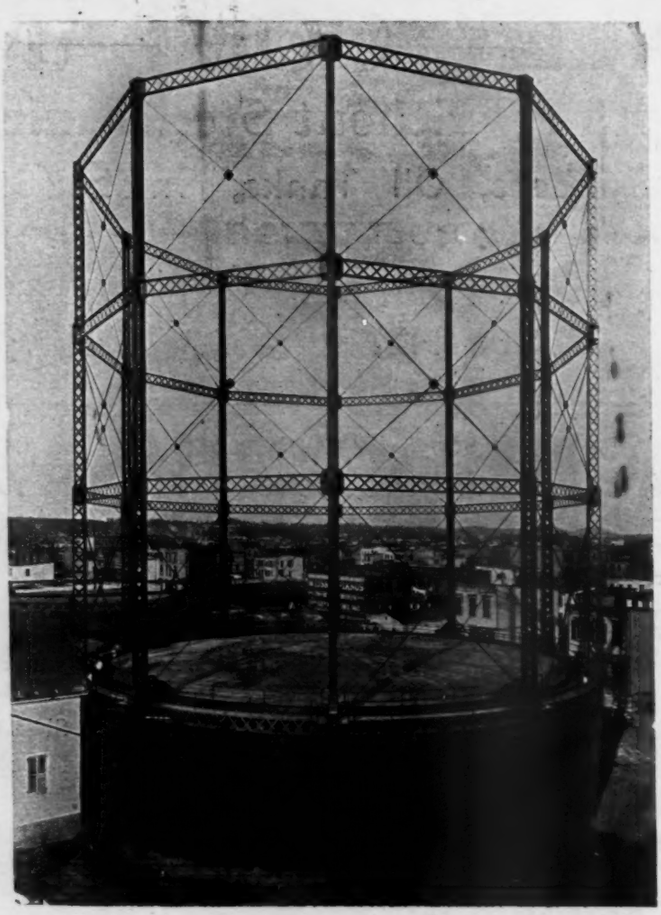

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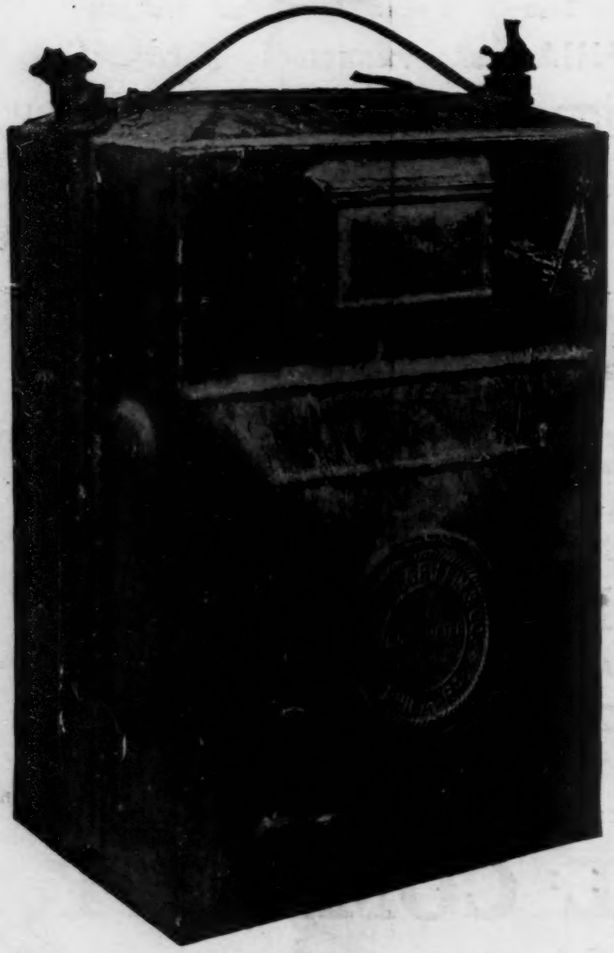

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